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# MINING AND SCIENTIFIC PRESS

ESTABLISHED 1860. 45th YEAR.

Whole No. 2320.—VOLUME XC.  
Number 1.

SAN FRANCISCO, CAL., SATURDAY, JANUARY 7, 1905.

THREE DOLLARS PER ANNUM.  
Single Copies, Ten Cents.

Cable: "RISDON'S"

COOES { A. B. C.; Moreing & Neal;  
Liebers; Bedford McNeill;  
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**GOLD DREDGES**

AND ALL CLASSES OF

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THE ROESSLER & HASSLACHER CHEMICAL COMPANY,  
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**CYANIDE,** AND OTHER CHEMICALS FOR MINING  
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DENVER, COLO.  
STEAM ELECTRICAL AND HYDRAULIC ENGINEERING — MINE AND SMELTER SUPPLIES.

SEE  
ADV.  
PAGE  
8.

**SULLIVAN  
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MINING AND  
QUARRYING MACHINERY.

SEE PAGE 14.

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We Supply Everything Needed in a

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WE WILL BE PLEASED TO QUOTE PRICES.

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CAPACITY 600 DRILLS 10 HOURS  
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For Water Development, etc.  
3 inches to 40 inches diameter.  
AMERICAN SPIRAL PIPE WORKS,  
Chicago, Ill.  
Attractive prices, quick shipments.

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IT'S NOT A  
**CROSBY**  
SPRING SEAT  
VALVE  
THEY ARE  
LEAK PROOF  
ALL WORKING PARTS  
RENEWABLE WITH-  
OUT REMOVAL FROM  
PIPING



THE WIRE COIL  
DOES THE  
BUSINESS  
The Branden  
PUMP VALVE  
WILL OUTLAST  
SEVERAL ORDINARY  
RUBBER VALVES  
TRY THEM



January, 1905, A SPECIAL ISSUE  
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**CHALMERS & WILLIAMS,**  
SUPPLIES FOR  
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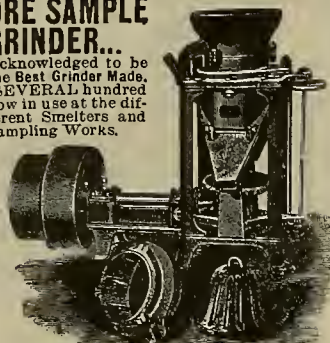
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GRINDER...Acknowledged to be  
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SEVERAL hundred  
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Write for particulars to

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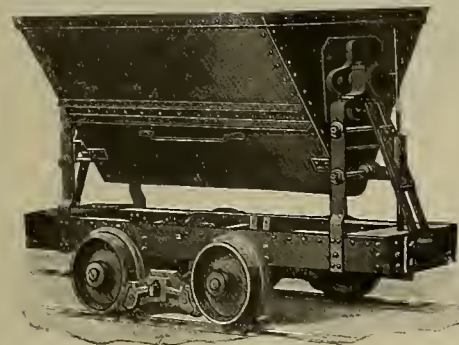
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ARE WHAT WE MAKE,  
And have been making for thirty  
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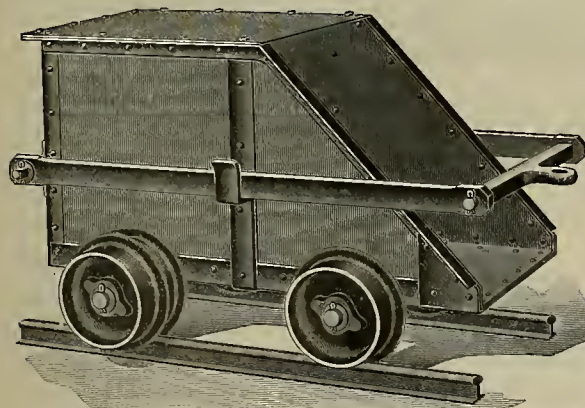
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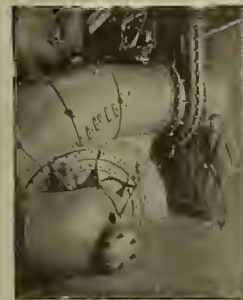
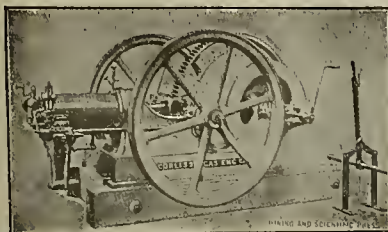
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is interesting and is Free.SMOOTH-ON MFG. CO., Jersey City, N. J., U. S. A.  
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LATEST IMPROVED.Operated with Gasoline, Distillate or  
Crude Oil direct, without Generator, mak-  
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Write for information.Corliss Gas Engine Co. Inc.  
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For Handling Gravel, Clay, Broken Ores, Tailings or Stripping  
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OPERATED BY ONE MAN.

SWINGS THROUGH COMPLETE CIRCLE.

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LOCOMOTIVESFOR MINE, LOGGING, SWITCHING,  
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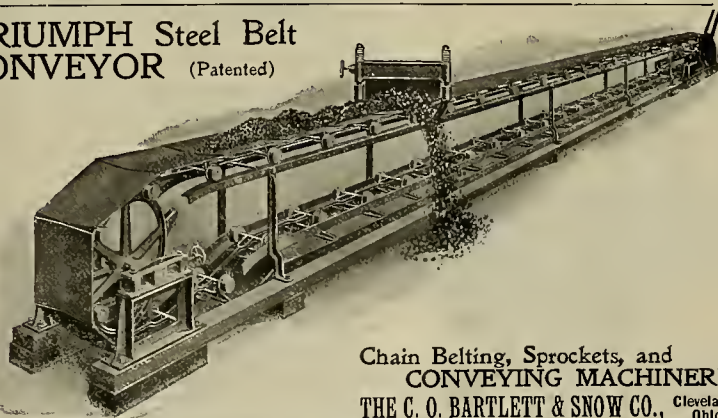
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STEAM and  
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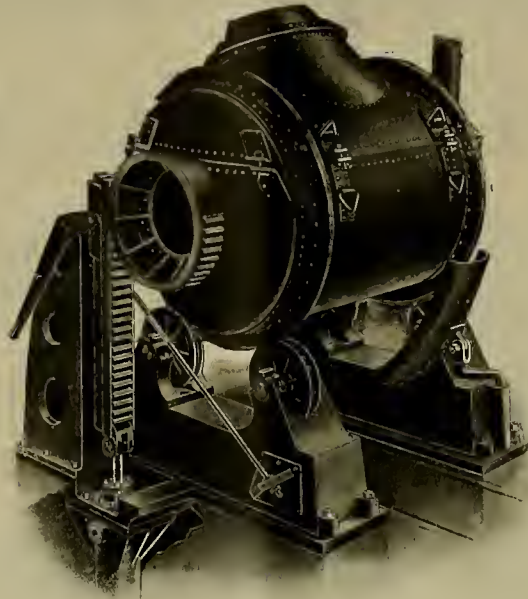
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Haulage—Most Economical. Dependable, Safe and Satis-  
factory. Illustrated Catalogue on application if mine  
owner or official. Address, mentioning this paper.H. K. PORTER COMPANY, N. W. CORNER  
WOOD & SIXTH, PITTSBURG, PA.TRIUMPH Steel Belt  
CONVEYOR (Patented)Chain Belting, Sprockets, and  
CONVEYING MACHINERY.THE C. O. BARTLETT & SNOW CO., Cleveland  
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Are evaporating more than their weight  
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**Builders of**  
**High Grade Mining Machinery,**  
**American-Crossley Gas Engines,**  
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The recently completed additions to our works have more than doubled their capacity and we are now in position to make quick delivery of all orders—large or small.

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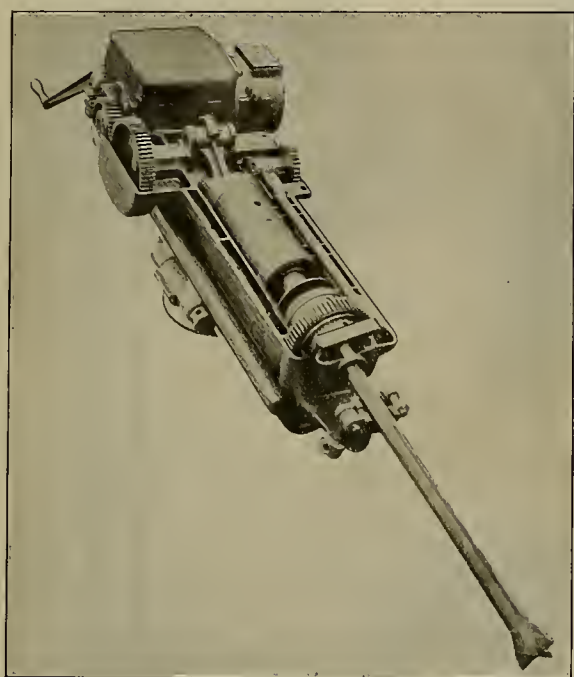
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# THE DENVER ENGINEERING WORKS COMPANY,

DENVER, COLORADO, U. S. A.

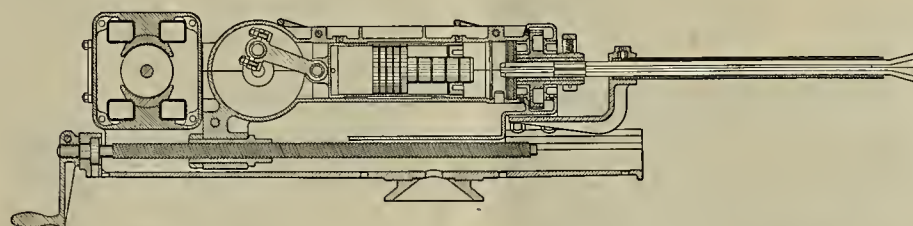
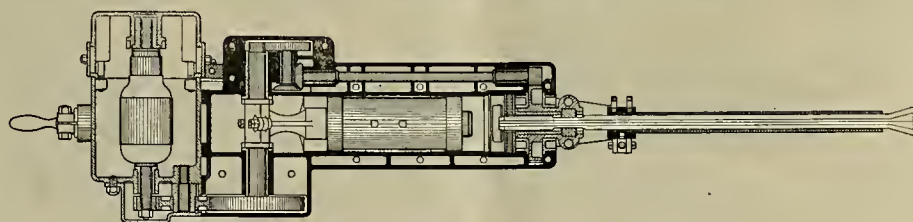
## Box Electric Drill.



NO FLEXIBLE SHAFT.

NO SPRINGS.

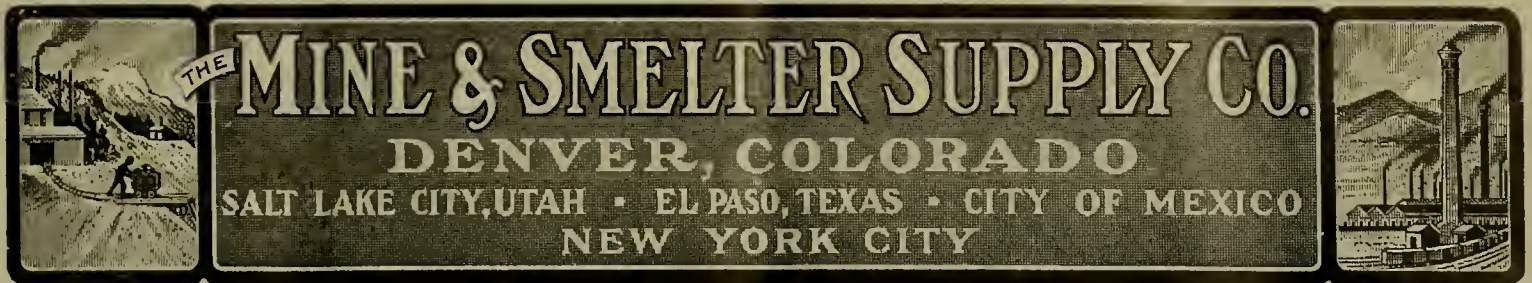
The entire moving mechanism is so constructed as to require only two bolts to hold it together. There are no keys or setscrews to get loose. All moving parts run in oil-tight case except the motor, and this does not require oil. No ball-bearings or other delicate details of construction.



Examine these cuts carefully; then send for supplement to Bulletin No. 1021.

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The Denver Engineering Works Company,  
DENVER, COLORADO.

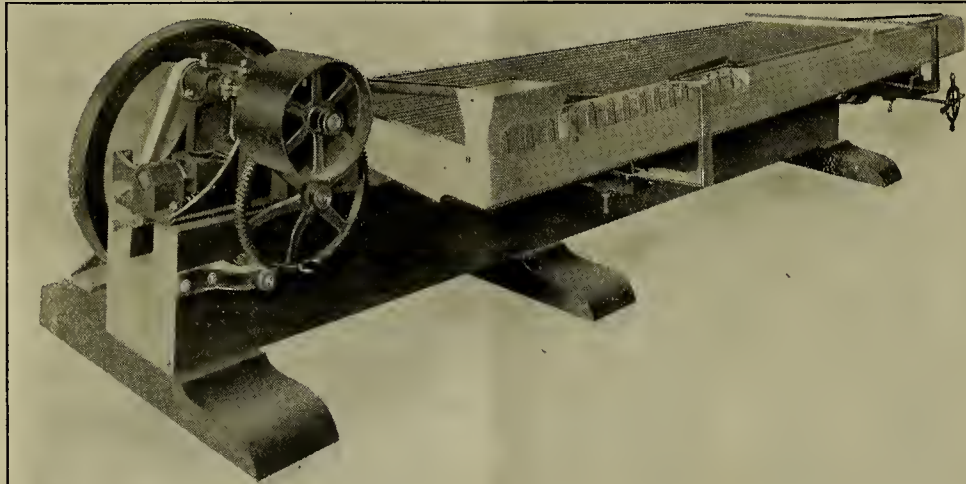


# THE WILFLEY CONCENTRATOR

## NEEDS NO INTRODUCTION.

They are in Use in the Leading Mills of the World.

Eleven Thousand Sold.



Five years ago a prominent mill manager said:  
 "The Wilfley Table saves everything that a gold  
 pan can save and will in time I believe supersede  
 all other concentrating devices."

He was right. The Wilfley Table is replacing  
 all other makes of tables.

Full details in Bulletin S-6. Send for it.

**Our Stock of Mining and Milling Machinery and Supplies is  
 Complete and the Largest in the West.**

**WE ARE AT YOUR SERVICE — COMMAND US.**

**We carry a very Complete Stock of Assay Supplies in each  
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**PRICES RIGHT — GOODS GUARANTEED.**

New York City Address, 42 Broadway.



# Our Latest Book on Our Latest Breaker



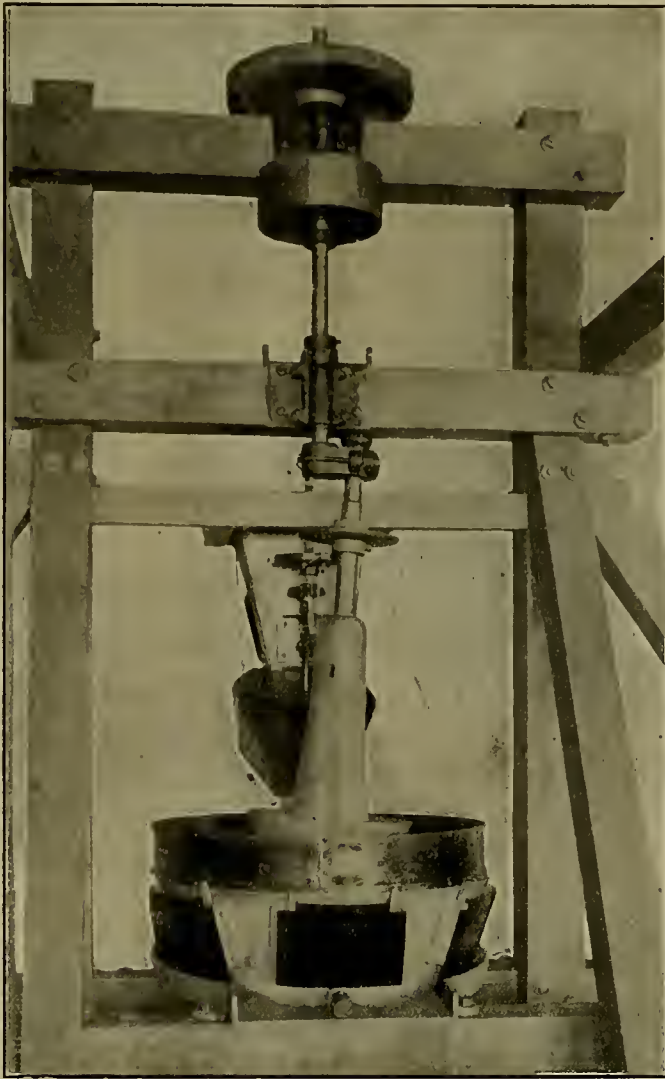
## Why a Style "K" Gates Rock and Ore Breaker is Best.

- REQUIRES LEAST POWER TO OPERATE. — The "K" style breaker requires less power than any other style of breaker.
- EASY OF FEEDING. — The "K" style breaker is so designed that it can be fed by hand or by a conveyor.
- UNOBSTRUCTED DISCHARGE. — The "K" style breaker has no obstructions in the discharge.
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- EASY SUSPENSION OF SHAFT. — The "K" style breaker is so designed that it can be suspended by a single shaft.
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- EASY RUNNING. — The "K" style breaker runs easily and smoothly.
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- CONVENIENCE IN CHANGING WHEELS. — The "K" style breaker is so designed that it is convenient to change wheels.

Yours for the asking.

Canadian Representatives, Allis-Chalmers-Bullock Ltd., Montreal.





## THE BEST WAY to Treat Slimes is NOT TO MAKE THEM.

**DO YOU KNOW** that hundreds of thousands of tons of ore that defied concentration with the stamp mill have been successfully concentrated after being crushed in the KINKEAD MILL?

**DO YOU KNOW** that tens of thousands of dollars have been taken out of the waste dumps of the Bonanza Mines of the Comstock with this Mill: rock so low in value that it was used to grade the streets with?

**DO YOU KNOW** that thousands of tons of hard quartz from the lower levels of the Comstock have been and are being successfully treated by the Kinkead Mill to-day?

**DOES IT INTEREST YOU TO KNOW** that we are operating six mills and six concentrators with less than 20 Horse Power, and that as far as ease of installation, economy in power and wear, and in even quality of pulp delivered, is concerned, the Kinkead Mill is as far ahead of other mills as the Pullman car is ahead of the stage coach?

**LASTLY, DO YOU REALIZE** that crushing by percussion is wrong in principle, and that crushing by a pressure is the correct way?

**IF YOU WANT TO KNOW MORE** about what the Kinkead Mill can do, write us.

## Henshaw, Bulkley & Co.,

Sole Agents for North and South America, Mexico and Central America,

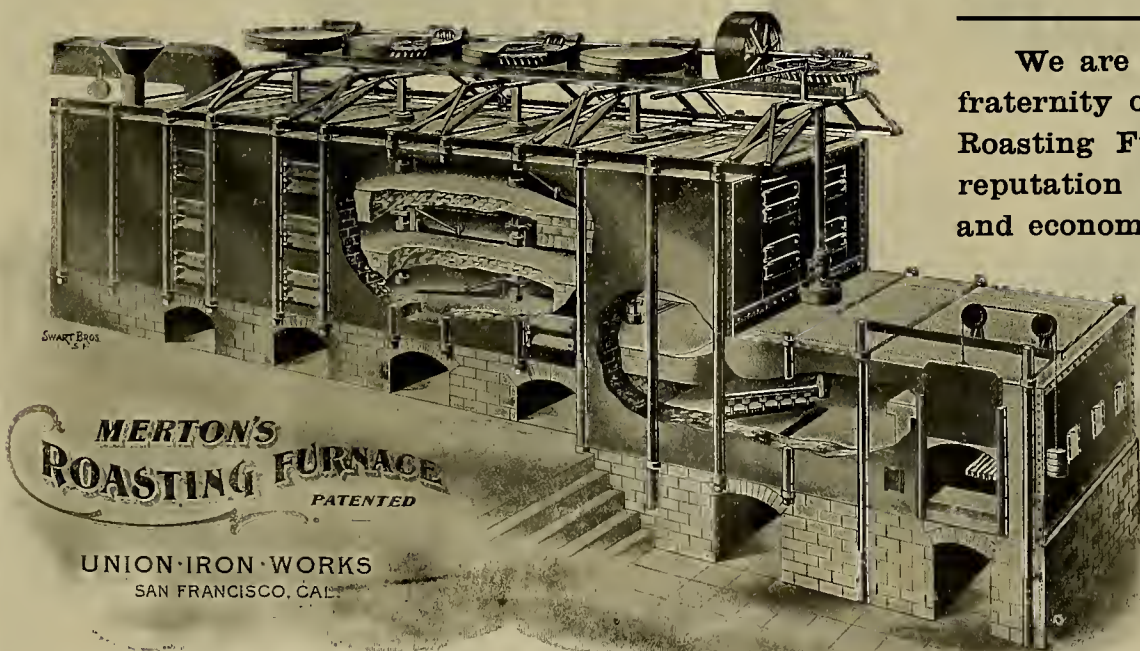
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ENGINES, BOILERS, PUMPS, HEATERS, INJECTORS, ROCK DRILLS, AIR COMPRESSORS, BLOWERS, HOISTS, IRON AND WOOD-WORKING TOOLS, GENERAL MINING SUPPLIES.

# UNION IRON WORKS,

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We are introducing to the mining fraternity of this country a type of Roasting Furnace having an enviable reputation for all around efficiency and economy in Australia and other

British Colonies where it was perfected and first put into operation.

It has points of superiority over all other types of mechanical Roasting Furnaces that we would like to explain to interested parties.

WRITE US FOR PRICES AND SPECIFICATIONS OF MINING AND METALLURGICAL MACHINERY OF LATEST APPROVED DESIGN.

**BUSHINGS**

Without Oil  
or Grease.

**BUSHINGS**

**GRAPHITE AND BRONZE BUSHINGS AND BEARINGS**

For AERIAL TRAMWAYS, HOISTS, LOOSE PULLEYS, TACKLE BLOCKS, Etc., Etc.

Invaluable to the mining field. On the market 15 years  
Never require lubricant of any kind. Fully guaranteed.

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**BUSHINGS**

Without Oil  
or Grease.

**BUSHINGS**



THE PIONEER MINING MACHINERY HOUSE OF THE WEST.

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DENVER, COLO.

STEAM ELECTRICAL AND HYDRAULIC ENGINEERING — MINE AND SMELTER SUPPLIES.

## CARD

Success in concentration depends largely on the machinery employed.

If your mill is equipped with the CARD Concentrator and SPERRY Slimer you are on the road to success.

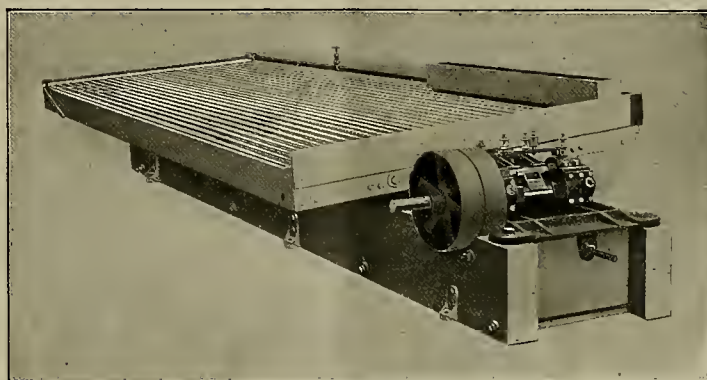
Floor space required for the CARD, 6x18 feet; for the SPERRY, 11x11 feet.

Late improvements have doubled the capacity of the Card Table.

## TABLE

Write A Postal To-Day

IF YOU WANT TO KNOW  
MORE ABOUT THE



Card Concentrator

AND THE



Sperry Slimer.

## SPERRY

Don't blame the mill man if the values are going down the creek.

Buy him a CARD Concentrator and SPERRY Slimer and save the values. He will appreciate it. So will you. Any mill man can operate them successfully. Hundreds now in use.

The Sperry is a slimer in fact as well as in name.

## SLIMER



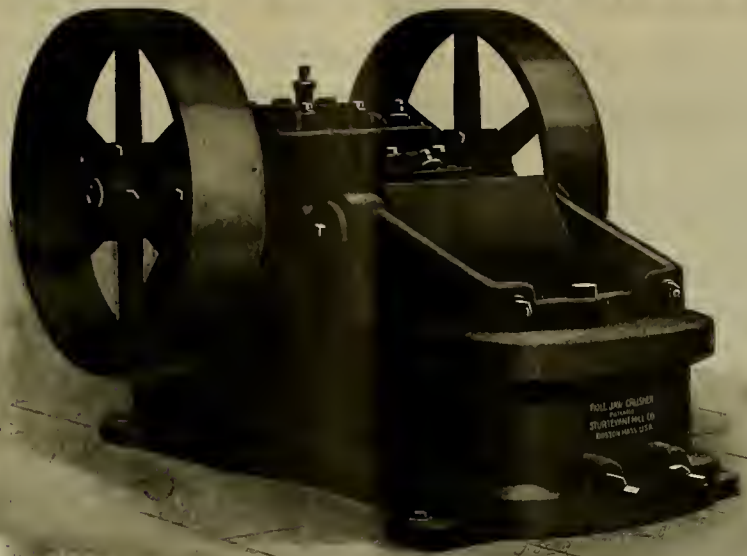
# ROLL JAW FINE CRUSHERS

**Crush  
Fine**

FOR

**Stamps, Rolls  
or Mills.**

It costs no more to  
crush fine in  
these machines.



**Crush  
Fine!**

It is cheaper than  
forcing your  
grinding machines  
to do crusher  
work when they  
were designed  
for pulverizing.

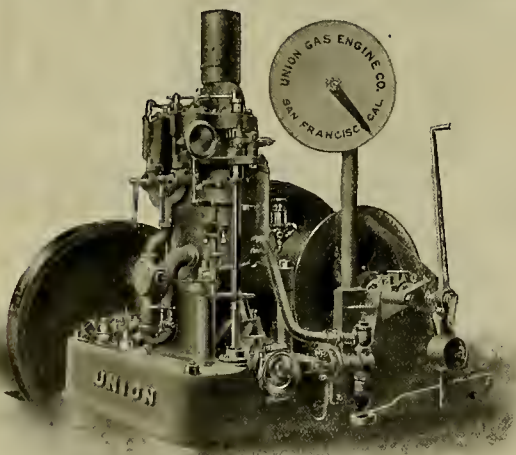
**The Only Crusher Able to Crush Large, Hard Ore to  $\frac{1}{4}$  Inch, WITHOUT SCREENING.**  
**FOR FEEDING FINISHING MACHINES, FINE CRUSHING MEANS: ONE-THIRD MORE CAPACITY,**  
**LESS WEAR AND TEAR, AND LESS POWER. UP-TO-DATE PLANTS CRUSH FINE.**

**Send for Catalogue of CRUSHING AND GRINDING MACHINERY.**

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**Coast Agents: HARRON, RICKARD & McCONE, San Francisco, Cal.**

## "UNION" HOISTS.



30 H. P. Double Cylinder "Union" Hoist. Safety latch holds the load at any level desired. Shaft extends over side of base to receive a pulley for driving pump or other machinery. Being a double cylinder, it hoists like a steam engine. Fitted to run on Gasoline, Benzine or Distillate.

5000 "Union" engines have been sold during the past 20 years. Hundreds of "Union" hoists, in sizes from 3 to 130 H. P., and "Union" stationary engines, in sizes from 2 to 300 H. P., in actual use, have made the word "Union" synonymous with quality. The leading governments of the world have adopted the "Union."

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**UNION GAS ENGINE CO.,**

248 FIRST STREET,

SAN FRANCISCO, CAL.

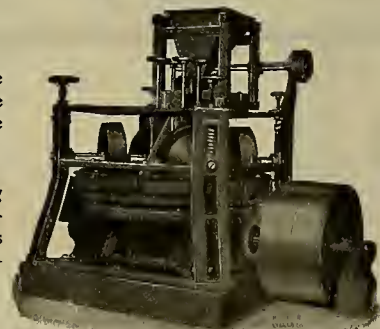
## SAVE YOUR VALUES!

SOMETHING ABOUT UNIFORM ORE REDUCTION.

**The Elspass Mill for Ore  
Reduction.**

Will save your free  
coarse gold in the  
mill without the use  
of mercury.

Perfect panning  
motion, the revolving  
and rollers  
remaining stationary.



No slimes.

More lineal feet of  
screen surface than  
any other mill.

Less horse power to  
operate than any  
other mill of its size.

**The Elspass Four-Roller  
Quartz Mill.**

**WE WILL CONSTRUCT YOUR COMPLETE PLANT AND PUT IN THE  
Entire Machinery Equipment.**

SEND FOR CATALOGUE AND PRICES.

WE KNOW WE CAN SAVE YOU MONEY.

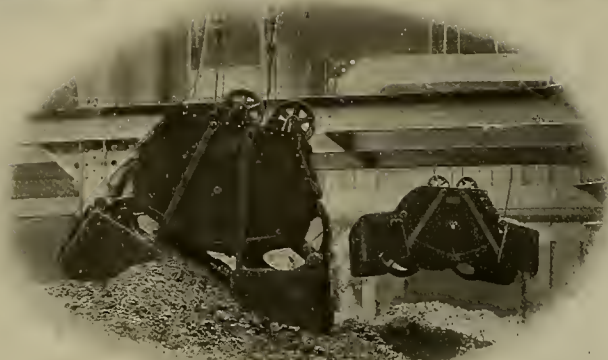
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WELLMAN-SEEVER-MORGAN ENGINEERING DIVISION      ENGINEERS AND MANUFACTURERS      WEBSTER, CAMP & LANE DIVISION



HULETT PATENT EXCAVATING BUCKETS AT WORK IN HOLD OF VESSEL.

Especially adapted for unloading material from limited areas, such as boats, cars, bins, etc. Also for transferring from stock-piles, re-loading, etc. Built in a variety of sizes.

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Mining Machinery; Ore and Coal Handling Machinery; Power Machinery, etc.

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Johannesburg, S. Africa: Sherriff, Swingley & Co. Ltd.

# Steam and Power PUMPS

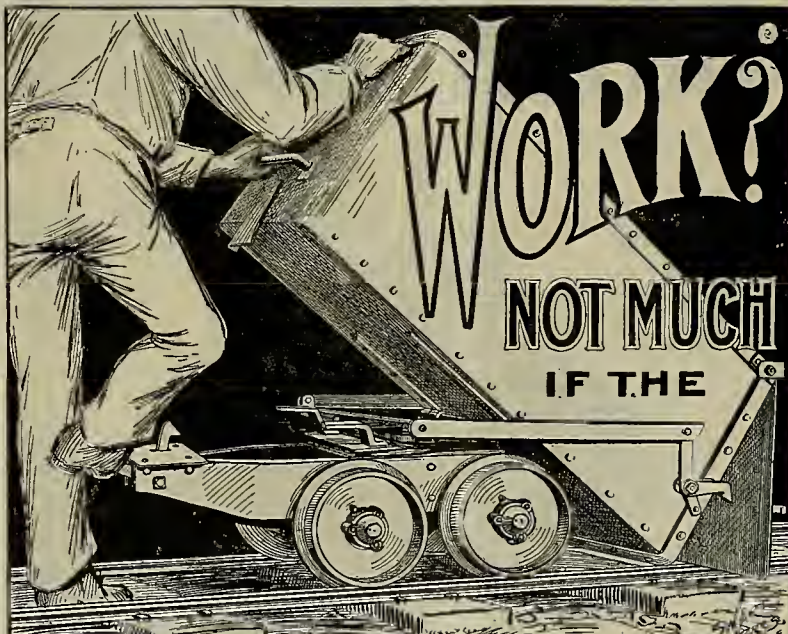
...FOR...

Every Possible Duty  
ARE MANUFACTURED  
AND KEPT IN STOCK

...BY...

Geo. E. Dow Pumping Engine Co.,

179 First Street, San Francisco, Cal.



**WORK?**  
**NOT MUCH**  
**IF THE**  
**TRUAX AUTOMATIC ORE CAR**  
**IS USED.**

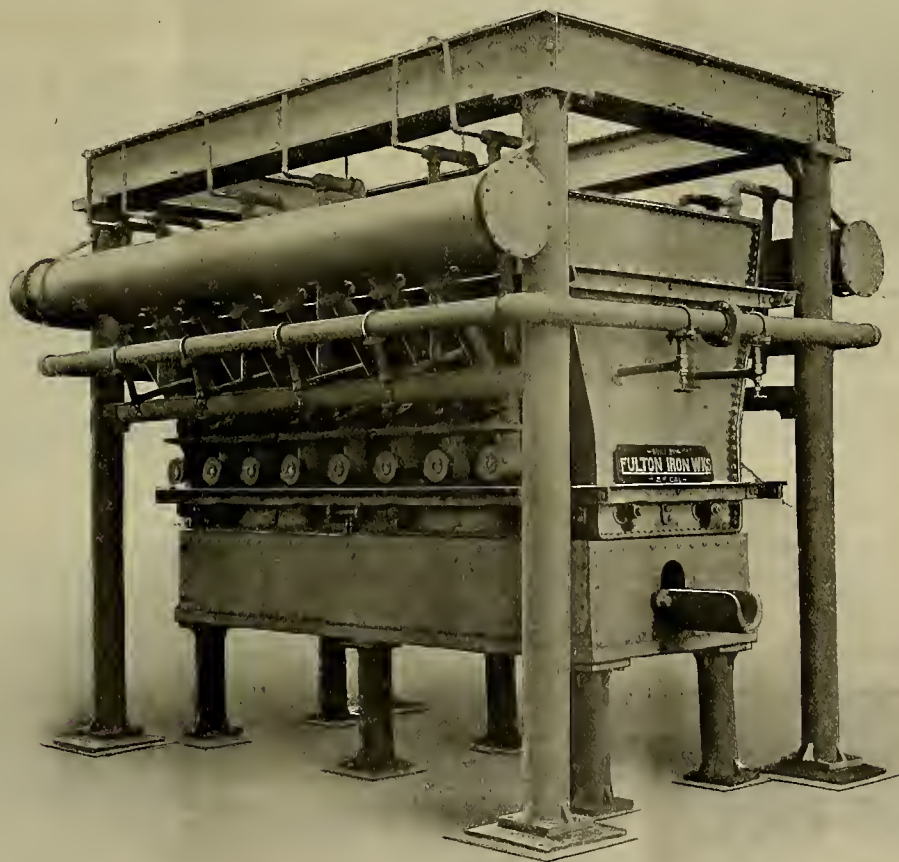
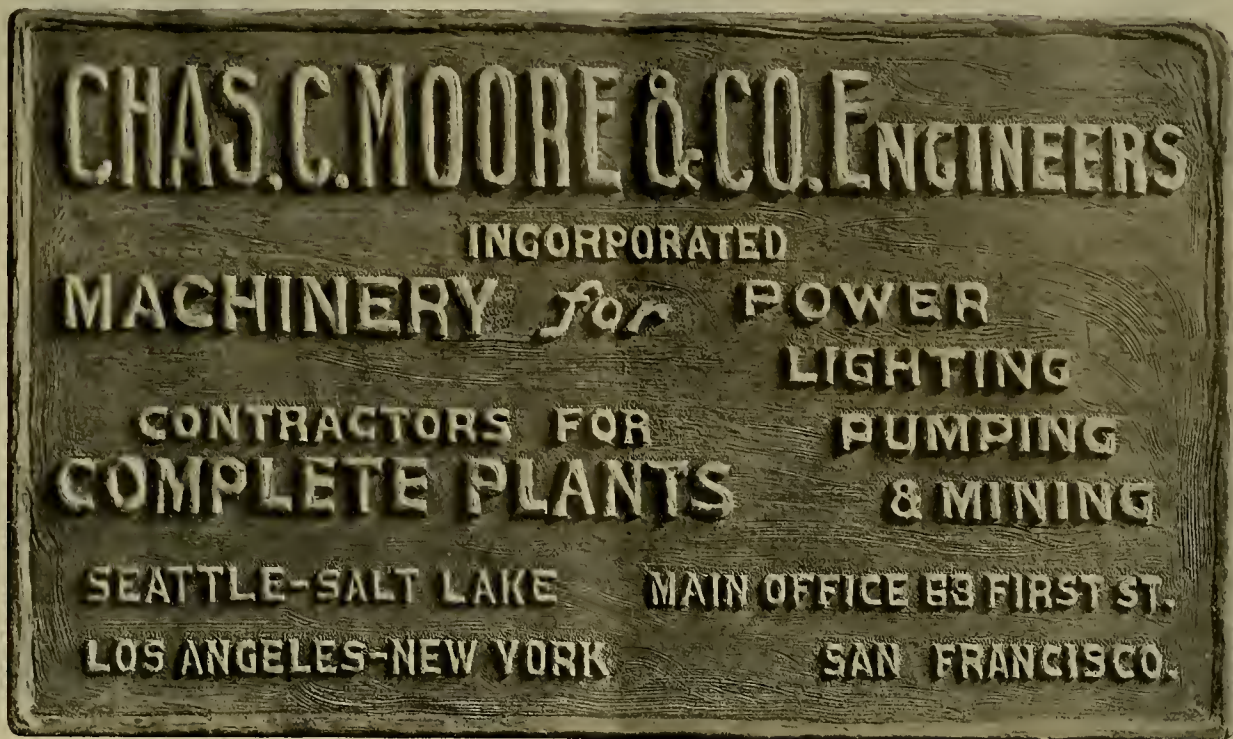
Easy to load. Easy to run. Easy to dump.  
Low in height. Low in price. High in quality.  
All Cars fitted with Self-Oiling Dust Cap Wheels.  
Constructed of Steel, Wrought Iron and Malleable Castings.  
All sizes easily dumped by one man.  
Ask for Ore Car Catalogue No. 10.

**GLOBE IRON WORKS,**

55 WEST MAIN ST., STOCKTON, CAL.

Cable Address "Globeworks."





## SMELTING FURNACES

## ROASTING FURNACES

Revolving and  
Reverberatory.

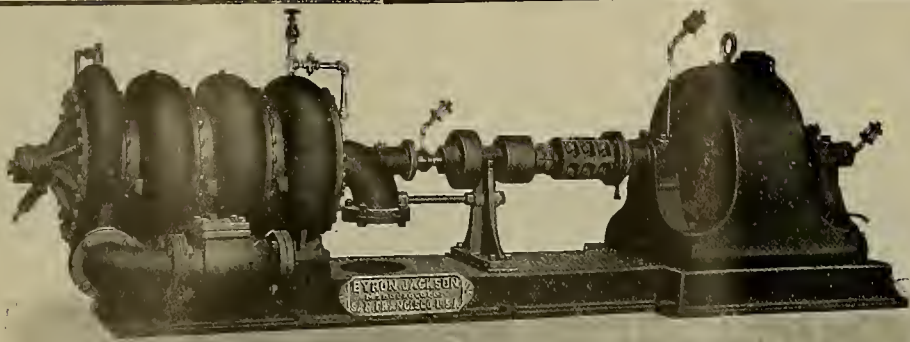
## COMPLETE SMELTING EQUIPMENT

Modern  
Construction.

# FULTON IRON WORKS,

15 FIRST STREET, SAN FRANCISCO, CAL.





Jackson's Series 4-Step Centrifugal Pump Direct-Connected to Westinghouse Motor.

**BYRON JACKSON MACHINE WORKS,**  
411 Market Street, San Francisco, Cal.  
WRITE FOR CATALOGUE "O".

# Pumps

**JACKSON'S CENTRIFUGAL PUMP**  
— IS THE —  
**WONDER of the AGE**

because there is nothing on the market like it. We are convincing the most skeptical that JACKSON'S HIGH HEAD CENTRIFUGAL PUMP is doing all that we claim for it. That it is taking the place of steam and plunger pumps cannot be denied. That its first cost is less is acknowledged. That the cost for maintenance is reduced to a minimum has been proven. That the efficiency is guaranteed, and that the pumps are designed to raise water 2000 feet or more.



'PHONE, MAIN 328.

## The Vencedora Hot Blast Smelter.

This improved Furnace is adapted for Smelting Copper Ores, Sulphide Ores containing gold and silver, and Concentrates from Vanners or Tables, the Blast being easily adjusted to meet all requirements. Our method of producing this Blast at very high temperature without the use of extra fuel is a new feature and one of our strong claims, effecting great economy in operation.

**These Smelters are Built in Sizes, and with capacity of 8 to 50 tons and upwards in 24 hours.**

The smaller sizes can be packed on mules to locations ordinarily inaccessible, making it an ideal proposition for small mining operations as well as large ones.

They are guaranteed reliable and economical, can be seen working at the Fulton Iron Works, San Francisco. Pamphlets with full information will be mailed upon request.

ADDRESS: **THE VENCEDORA MINE EQUIPMENT CO.,**  
Stock Exchange Building, 331 Pine Street, San Francisco, California, U. S. A.

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W. C. RALSTON. ARTHUR G. FISK. HARRY T. CRESWELL. CHARLES HIRSHFELD. JAMES SPIERS.

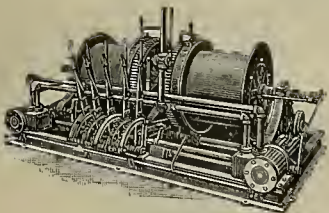
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DELTA

**THE PHOSPHOR BRONZE SMELTING CO. LIMITED,**  
2200 WASHINGTON AVE. PHILADELPHIA.  
"ELEPHANT BRAND PHOSPHOR-BRONZE"  
INGOTS, CASTINGS, WIRE, RODS, SHEETS ETC.  
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ORIGINAL AND SOLE MAKERS IN THE U.S.

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For Mines, Quarries, Contractors,  
Pile Driving and Tail Rope  
Haulage.

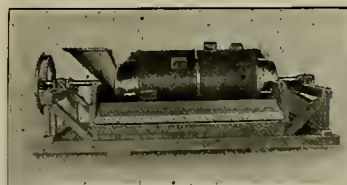
**CABLEWAYS AND TRAMWAYS**  
SLATE MACHINERY.

All parts made to duplicate.

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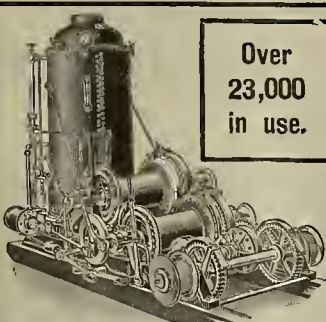
At once a grizzly, a trommel and an elevator, for washing mud, clay, talc, etc., from coarse ores and boulders before crushing.

It automatically feeds the crusher, increases its capacity 100%, and free ore is not crushed or rolled.

## AMERICAN CONCENTRATOR COMPANY

JOPLIN, MO., U. S. A.

WE MAKE A SPECIALTY OF  
PHOTO-ENGRAVING CO. MECHANICAL ENGRAVINGS  
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SAN FRANCISCO, CAL.



Over  
23,000  
in use.

## LIDGERWOOD HOISTING ENGINES

— STEAM AND ELECTRIC —

Are built to gauge on the Duplicate Part System. Quick Delivery Assured.  
**STANDARD FOR QUALITY AND DUTY.**

For Contractors, Bridge Builders, Mining, Pile Driving, Railroads, Quarries and General Hoisting Purposes.  
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## Sonora Mining Agency.

ALL KINDS OF MINING BUSINESS ATTENDED TO.  
MINES AND PROSPECTS BOUGHT AND SOLD.  
ASSAYING AND SURVEYING.

J. B. BUTLER, Sec'y, Mochizuma, Sonora, Mexico.  
REFERENCES } First National Bank of Douglas.  
} Banco de Sonora, Hermosillo.

## Quicksilver

BY THE FLASK OR CARLOAD.  
WEIGHT AND QUALITY GUARANTEED.  
**THE EUREKA COMPANY,**  
OF SAN FRANCISCO.

320 SANSOME STREET, SAN FRANCISCO.



**THE CONDUCT OF MINING OPERATIONS ON A BUSINESS BASIS INVOLVES THE USE OF THE *BEST* MACHINERY**

These figures are taken from the following sources :

ON THE PISTON DRILL — from an article on page 3136 of the September, 1904, issue of "Compressed Air."

ON THE WATER LEYNER — from a record of eleven months' actual work in the Central Tunnel, at Idaho Springs, Colo., kept by the contractor.

Copies of both can be had free by writing us.

**COMPARISON.**

**THE PISTON DRILL. || THE WATER LEYNER.**

**1. Description of Machines.**

*Specially prepared. Cylinder carefully bored. Special piston of high carbon steel, ground into cylinder. Valve of tool steel. Valve chest carefully bored. "The remaining portion of the machine received very careful attention."*

A stock machine, without any special preparation whatever.

**2. Time Operated.**

Fourteen months. || Eleven months.

**3. Approximate Footage Drilled.**

13104 feet (two shifts) or || 17122 feet (one shift only).

6552 feet (one shift).

**4. Approximate Footage Drilled Per Month.**

468 feet (one shift). || 1556 $\frac{2}{3}$  feet (one shift).

**COMPARISON.**

**THE PISTON DRILL. || THE WATER LEYNER.**

**5. Average Time of Drilling Shift.**

Not stated. || 5 hours, 15 minutes.

**6. Cost of Repairs Per Lineal Foot Drilled.**

\$0.0183. || \$0.0054 (less than  $\frac{1}{2}$ ).

**7. Number Lineal Feet Drilled per Shift per Drill.**

18 feet (364 shifts, deducting || 69.88 feet (245 shifts, actual).  
for 61 Sundays).

**8. Labor Cost per Lineal Foot Drilled.**

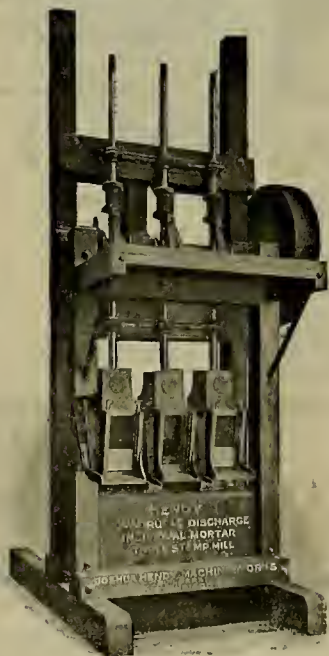
(Drill Runner, \$3.50; Helper, \$3.00.)  
\$0.3611 per foot. || \$0.093 per foot.

(Granting equal inbor. However, in the Central Tunnel, only one helper was used for the two drills, thus making the actual cost \$0.0715.)

**WHICH is the Most Economical and Efficient ? ?**

**THE J. GEO. LEYNER ENGINEERING WORKS CO.**  
**DENVER, COLO., U.S.A.**

A "HENDY" QUADRUPLE DISCHARGE  
INDIVIDUAL MORTAR,  
THREE-STAMP MILL.



CAPACITY, 18-24 TONS.  
POWER REQUIRED, 10 H. P.  
WEIGHT OF MILL, 23,000 LBS.

**If We Don't Get Your Business,  
We Both Lose Money.**

**BECAUSE:** GOOD Mining Machinery costs no more  
than POOR machinery—often less.

Only be sure **HENDY'S** name is on it. It has meant  
good machinery for several generations.

**IT**

MEANS THE SAME TO-DAY.

MEANS PROMPT AND CAREFUL SERVICE.

MEANS PROGRESS IN MACHINERY MAKING.

MEANS PROPER MACHINERY FOR EVERY PURPOSE.

MEANS CAREFUL ATTENTION TO EVERY ORDER, NO MATTER  
WHAT ITS SIZE MAY BE.

Altogether it means much more than you may imagine, and you  
cannot know the superiority of our mining machinery unless you  
use it.

Write for new catalogue—just out. Do it to-day.

**Joshua Hendy Machine Works,**

ENGINEERS,

FOUNDERS,

MACHINISTS,

SALESROOM.....38-44 FREMONT ST.  
WORKS.....COR. BAY AND KEARNY STS.

**SAN FRANCISCO, CAL., U. S. A.**



# SULLIVAN MACHINERY CO.



Sullivan Hand Power Diamond Drill, with Horse Power Attachment.

Capacity 350 feet.

May also be driven by Gasoline Engine.

Larger drills for deeper holes.

Catalogue 49.

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NEW YORK CHICAGO, U.S.A. DENVER  
PITTSBURG EUROPEAN AGENTS 23 RUE RAPPEL, PARIS EL PASO

## The Adams All-Steel Electrically-Driven ROCK DRILL



Requires only one to two and one-half horse power to operate, and will do as much work as any steam or air drill of equal weight.

If you are interested in mining metals or quarrying rock, marble, slate or salt, write us for further information.

THE ADAMS ROCK DRILL IS A LABOR SAVER.

THE ADAMS ROCK DRILL IS A POWER SAVER.

THE ADAMS ROCK DRILL IS A MONEY SAVER.

The Gardner Electric Drill & Mach'y Co.  
CLEVELAND, OHIO.

Branch Offices: 1515-17th St., DENVER, COLO.

G. A. THOMSON, SPECIAL AGENT, 136 LIBERTY ST., NEW YORK.

J. G. POMEROY, SPECIAL AGENT, 303 DEARBORN ST., CHICAGO.

# COM-PRESSORS ROCK DRILLS AIR TOOLS

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COMPRESSORS

ROCK  
DRILLS

PNEUMATIC  
HOISTS

GAS  
COMPRESSORS

PNEUMATIC  
TOOLS

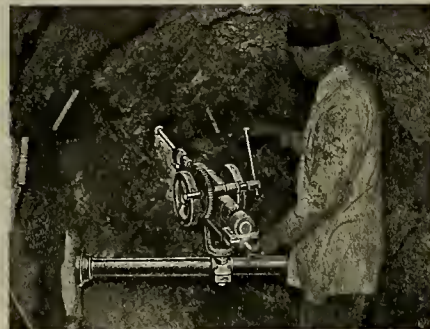
PUMPING  
SYSTEMS



We ship only good machines which we can sell at a fair profit. That is why the buyer who buys our product secures the best that there is on the market.

RAND DRILL CO. 128 BROADWAY N.Y.

## THE JACKSON HAND POWER ROCK DRILL.



1000 IN USE.

Operated by ONE man will do the work of THREE men drilling with bits and bammers. Its records in granite are wonderful. Made of steel. Guaranteed against breakage for two years.

WRITE FOR CATALOGUE 18.

W. M. MOTLEY,  
25 Broad St., New York.

## DIAMOND DRILLS

FOR PROSPECTING.

Machines for all capacities.  
Catalogue on request.

AMERICAN DIAMOND ROCK DRILL CO.  
95 LIBERTY STREET, NEW YORK.



## WOOD DRILL WORKS, PATERSON, N. J.

Makers of the ROCK DRILL that can be "cleaned-up with a sledge hammer" and "wiped off with a scoop-shovel and yet "stay with you."

—SOLD BY—

Tatum & Bowen, 34 Fremont St., San Francisco.  
Baker Iron Works, Los Angeles.  
Salt Lake Hardware Co., Salt Lake City.  
Fairbanks, Morse & Co., Denver, Colo.  
Robert Wood, 31 S. Canal St., Chicago.  
Moses P. Johnson, 715 N. 2nd St., St. Louis, Mo.

Marvin Electric Drills are in daily use that have been in continuous service for six years.  
MARVIN ELECTRIC DRILL COMPANY, Binghamton, N. Y.

DEWEY, STRONG & CO., Patent Agents, San Francisco, Cal., Washington, D. C.



# INGERSOLL-SERGEANT

## AIR COMPRESSORS

FOR

## SUBAQUEOUS TUNNELING.

ROCK DRILLS.

PNEUMATIC TOOLS.

# THE INGERSOLL-SERGEANT DRILL CO.

CHICAGO, ILL.  
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New York Tunnel Co. (Subway Tunnel under East River, New York.)  
Hudson Improvement Co. (Trolley Tunnel under Hudson River, New York.)

THIRTY-THREE AIR COMPRESSORS with a total capacity of 109,684 cubic feet of free air per minute.

# SHAW'S ECLIPSE AIR-HAMMER ROCK DRILL.



One man with one drill  
does the work of ten men  
with hand drills.

Can be used in any part of  
the mine.

Costs about one-fifth as  
much to install as other  
standard makes and  
requires but one-fifth the  
power to operate.

These drills are being used  
by some of the largest  
mines in the world.

Write us for list of users.

CARY BROS. John S. Cary.  
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Sales Agents for all Foreign Countries.

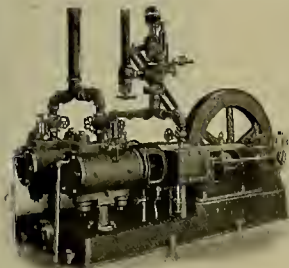


TESTING A 3 1/4" EXCELSIOR DRILL  
with our celebrated "AIROMETER," showing  
86.4 cubic feet free air used per minute at 80 pounds  
pressure. This drill has been sold after competi-  
tive tests at the Homestake and many other large  
mines in U. S. during year 1904.

WE OFFER \$100 to any standard drill  
that this drill cannot  
beat 25%. Send for particulars with official reports  
of drill tests. Our drills are sold under absolute  
guarantee to cost less for repairs and to cut more  
ground than any rock drill so far made. Do you  
want more drilling than you are getting? Do you  
want an accurate Air Meter? If so, write

G. D. WARREN & CO.,  
1520 -- 18th St., Denver, Colo.

FOR HARD ROCK  
THE BABY TORPEDO  
A CORLISS VALVE ROCK DRILL  
REX COMPRESSED AIR & DRILL CO.  
396 MISSION ST. SAN FRANCISCO CAL.



# FRANKLIN AIR COMPRESSORS.

Strong, Simple and Sound in Design.  
Economical, Efficient, and Easy to Operate.

# Chicago Pneumatic Tool Company,

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Chicago.



Our Catalogue No. 1 describes WATER WELL  
MACHINES of many sizes, both traction and non-  
traction, for wells 50 to 1000 feet deep, and gives  
full illustrated instructions for operating.  
Catalogue No. 2 describes MINERAL PROSPECT-  
ING MACHINES for exploring for Iron, Lead, Zinc,  
Coal and all minerals. Several sizes, both trac-  
tion and non-traction. Also PLACER GOLD TEST-  
ING MACHINES for assaying Alluvial Deposits,  
Lake and River Beds to bedrock. Can be used on  
boat.  
Also Sectionalized Machines and Boilers for  
easy transportation to difficult places. They make  
6 and 8 inch holes through anything and bring to  
the surface everything found. Full instructions  
for operating.

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sizes, with full equipment and instructions for operating.  
Our Machines are the sum of all excellence, in use all over the world. Top quality, bottom prices.  
Catalogues FREE.

KEYSTONE DRILLER CO., BOX 90, BEAVER FALLS, PA., U. S. A.



The Pennington Hammered Steel SHOES AND DIES  
ARE THE BEST IN THE WORLD.  
Manufactured only by ourselves.  
OTHER SPECIALTIES:  
CAM, CRANK AND STEAMBOAT SHAFTS.  
ROCK-BREAKER PLATES, CONNECTING RODS.  
BEST REFINED TOOL STEEL.  
DRILL STEEL, WEDGES, ETC.  
HAMMER, PICK, GERMAN & MACHINERY STEEL.  
IRON AND STEEL FORGINGS of all descriptions.  
Correspondence solicited and circulars mailed upon re-  
quest. Telephone Main 5197.  
GEO. W. PENNINGTON & SONS (Incorporated)

Main Works--S. W. Cor. Montgomery and Chestnut Sts., Office and Branch Works--313 FOLSOM ST., S. F.



# THE COLUMBIA DRILLER. Steel Frame. Iron Machinery.

Will stand in any climate. All sizes. Traction and non-traction. F  
drilling Blast Holes. 96 feet of 5-inch Blast Holes drilled in one day of twelve  
hours with No. 3 machine. Exploring for all kinds of minerals. Testing Allu-  
vial Deposits. Can be used on boat. For drilling Water, Oil and Gas Wells  
to any required depth. Driving Pipe. Cleaning out old Oil and Gas Wells to  
any depth. Pulling any weight of Casing or Pipe. Casing and Pipe unscrewed  
and screwed together with engine. Any string of Casing handled with two  
men and the machine more rapidly than is possible with standard Wood Rig  
with six men. Machines tested on purchaser's work before payment is required.

COLUMBIA DRILLER MFG. CO. Circular  
New Kensington, Pa. FREE.

# ARTESIAN WATER WELLS DRILLED.

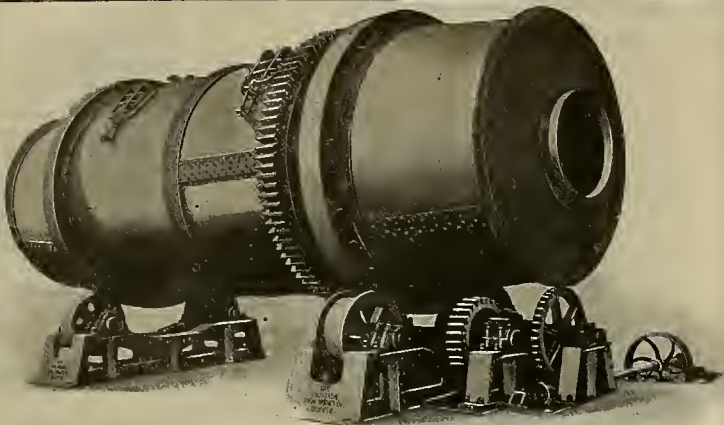
Water Wells Tested. Water Works Installed.  
PROPERTIES TESTED FOR MINERALS.  
Bridge Piers, Foundations, Etc.  
PUMPING AND DRILLING MACHINERY FOR RENT.  
SHREWSBURY & SMITH (Incorporated), Engineers, Office and Works, SAN MATEO, CAL.



# COLORADO IRON WORKS COMPANY

## ORE SMELTING EQUIPMENTS

## ORE MILLING MACHINERY



C. I. W. BRUCKNER ROASTER.

WE ALSO MAKE STRAIGHT-LINED STEEL DRYERS SIMILAR IN FORM TO THE OXLAND TYPE OF ROASTER,—HOWELL-WHITE FURNACES, RETORT FURNACES, ETC., ETC.

PRICES AND LITERATURE SENT UPON APPLICATION TO

## ORE ROASTERS AND DRYERS.

THE BRUCKNER ROASTING CYLINDER IS PROBABLY THE MOST POPULAR OF ALL REVOLVING ROASTERS. WE BUILD THEM IN SIZES TO SUIT ALL REQUIREMENTS.

6 x 12 FT.      7 x 16 FT.  
7 x 12 FT.      8½ x 18 FT.  
8½ x 26 FT.

CAPACITIES FROM 4 TO 25 TONS PER CHARGE.

THE 12 FT. CYLINDERS HAVE TWO OPENINGS, WHILE THE LARGER SIZES HAVE FOUR.

WE BUILD CAST IRON CYLINDER DRYERS IN THE FOLLOWING SIZES:

44 INCHES AT LARGE END,	36 IN. SMALL END,	16 FT. LONG.
44 " " " " " 33½ " " " 18 " "		
44 " " " " " 32½ " " " 24 " "		
44 " " " " " 29½ " " " 30 " "		

LARGER SIZES IF DESIRED.

NO FIRE BRICKS REQUIRED EXCEPT FOR FIRE BOX.

MAIN OFFICE AND WORKS,  
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**COLORADO IRON WORKS COMPANY.**  
**DENVER, COLORADO. U. S. A.**

EASTERN SALES AGENCY, ROOM 902, — 114-118 LIBERTY ST., NEW YORK CITY.

CITY SALES OFFICE,  
515 SEVENTEENTH ST.

## ASSESSMENT NOTICES.

**EUREKA CONSOLIDATED DRIFT MINING Company.**—Location of principal place of business, San Francisco, California; location of works, Placer County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on Friday, the 16th day of December, 1904, an assessment (No. 41) of one-half (½) cent per share was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, Room 3, No. 214 Pine street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 21st day of January, 1905, will be delinquent, and advertised for sale at public auction; and, unless payment is made before, will be sold on MONDAY, the 13th day of February, 1905, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. W. DIXON, Secretary.

Office—Room 3, No. 214 Pine street, San Francisco, California.

**MARINA MARSICANO GOLD MINING COMPANY.**—Location of principal place of business, San Francisco, California; location of works, Sunny Hill, Shasta County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 17th day of December, 1904, an assessment (No. 41) of five (5) cents per share, was levied upon the capital stock of the corporation, payable immediately in United States gold coin to the secretary, at the office of the company, 207 Battery street, Room 15, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 17th day of January, 1905, will be delinquent and advertised for sale at public auction; and unless payment is made before, will be sold on MONDAY, the 6th day of February, 1905, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

CHAS. BOVONE, Secretary.

Office—207 Battery street, Room 15, San Francisco, California.

**MAYDAY GOLD MINING COMPANY.**—Location of principal place of business, San Francisco, California; location of works, Calaveras County, California.

Notice is hereby given, that at a meeting of the Board of Directors, held on the 14th day of December, 1904, an assessment (No. 2) of three (3) cents per share, was levied upon the capital stock of the corporation, payable immediately in United States gold coin, to the secretary, at the office of the company, at Heald's Business College, No. 24 Post street, San Francisco, California.

Any stock upon which this assessment shall remain unpaid on the 24th day of January, 1905, will be delinquent, and advertised for sale at public auction; and unless payment is made before, will be sold on TUESDAY, the 7th day of March, 1905, to pay the delinquent assessment, together with the costs of advertising and expenses of sale.

By order of the Board of Directors.

EDWARD H. STEARNS, Secretary.

Office of Company—Heald's Business College, No. 24 Post street, San Francisco, California.

ESTABLISHED 1857

### A. LESCHEN & SONS ROPE CO.

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BRANCH OFFICES:  
NEW YORK — CHICAGO  
DENVER.

### WIRE ROPE

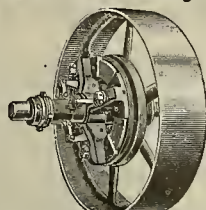
FOR  
MINES,  
QUARRIES,  
ELEVATORS,  
ETC.

### AERIAL WIRE ROPE TRAMWAYS

LESCHEN SYSTEMS  
DUSEDAU SYSTEM

UNDERGROUND, SURFACE  
& INCLINE WIRE ROPE  
HAULAGE OUTFITS.

## This May Be The One You Want.



Anyway, we desire to have every user and those who expect to use Friction Clutches or Friction Clutch Pulleys, possess a copy of our Friction Catalogue which sets forth the advantages of

### Frisbie Friction Clutches.

It may be had for the asking.

THE EASTERN MACHINERY CO., New Haven, Conn.

## FRENIER'S SAND PUMP.

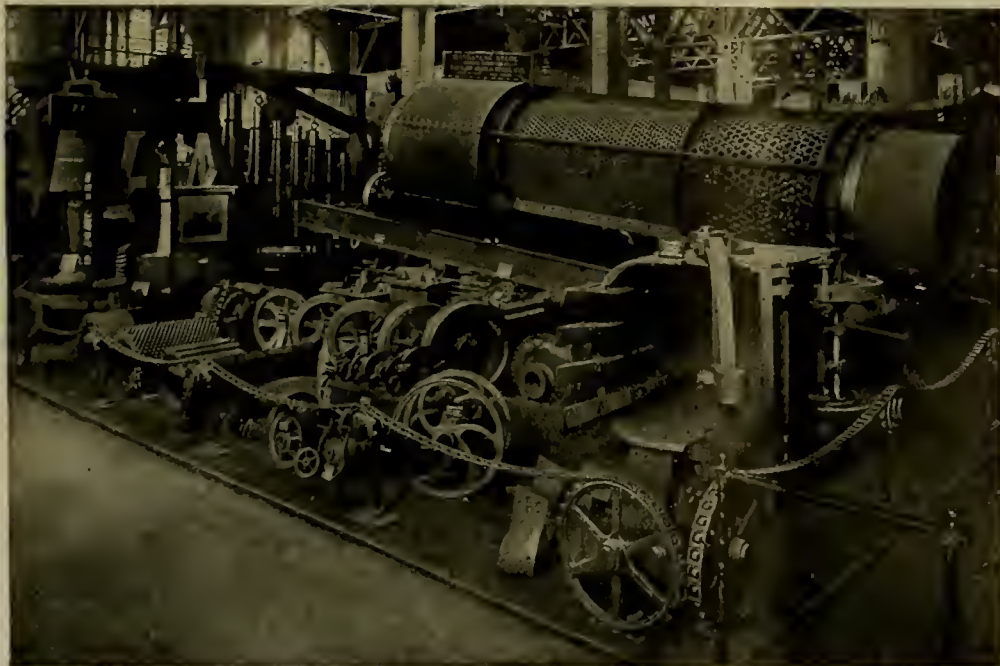
The Most Durable for  
BATTERY SANDS,  
Slimes, Tailings, Etc.

AGENTS:  
ALLIS - CHALMERS Co.,  
Chicago, Ill.  
STEARNS - ROGERS MFG.  
Co., Denver, Colo.  
HARRON, RICKARD &  
McCONE,  
San Francisco, Cal.



FRENIER & SON, Rutland, Vt.





Here's a few "Taylor Made" Parts.  
Did you see them at St. Louis?

## "Taylor Made" MANGANESE STEEL Is Best

### FOR HEAVY MINING WORK—

Digging, Conveying,  
Crushing or Sizing Ores  
—in fact, wherever un-  
usual strength and wear-

resistance are prime essentials in the wearing parts of necessary machinery, "Taylor Made" Manganese Steel is unequaled. It is the best for all kinds of rough service.

Look over the biggest Gold Dredges in the field to-day — you'll find the majority of them equipped with "Taylor Made" Manganese Steel bucket-lips and teeth, tumblers, rollers, pins and bushings.

Then there's mine car wheels — of which we make hundreds of patterns, suited to every requirement — and ship carloads almost every week to all parts of the country.

"Taylor Made" Manganese Steel chains and sprockets are the Standard for hard service — they stand up — do the work — and are always ready for more.

Same way with "Taylor Made" Manganese Steel jaw and gyratory crushers, plain and toothed rolls, and cheek plates.

Ditto in the necessary machinery for the coarse screening of heavy and sharp materials — ore, stone or coal.

In a word, "Taylor Made" Manganese Steel castings are ready for business every time, every where, and under every condition — they can "stand and deliver" 365 days in the year if required.

We would like to estimate on any of your heavy castings — and the more difficult the proposition the better we like it.

Maybe we can save you both time and money in 1905.

## TAYLOR IRON & STEEL CO.,

High Bridge, New Jersey, U. S. A.

Beside  
"Manganese Steel"  
we make  
Nickel Steel,  
Carbon Steel  
and  
"Taylor Special."

—  
All these Steels  
are  
Specially Adapted  
for  
Specific Requirements.



THE SLOGAN OF THE CAMERON~  
"CHARACTER THE GRANDEST THING"



DESIGN PATENT APPLIED FOR BY OFFICIAL GUIDE CO.

St. Louis 1904

Official Award Ribbon



Issued by Authority of the  
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EXPOSITION

*David C. Francis*  
PRESIDENT

*A. H. Stoff*  
DIRECTOR OF EXHIBITS

GOLD MEDAL

AWARDED TO

H. S. CAMERON  
Steam Pump Works  
NEW YORK CITY, U.S.A.

FOR  
GENERAL SERVICE

and

MINING PUMPS.

Department of Machinery  
Group 34, Class 430

*H. M. Mason*  
CHIEF

To All to Whom These Presents Shall Come

Greeting:

This Declaration

Is to Certify that the Attached

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By the Authority of the

Louisiana Purchase  
Exposition

Bearing the Signatures of

*David C. Francis*  
PRESIDENT

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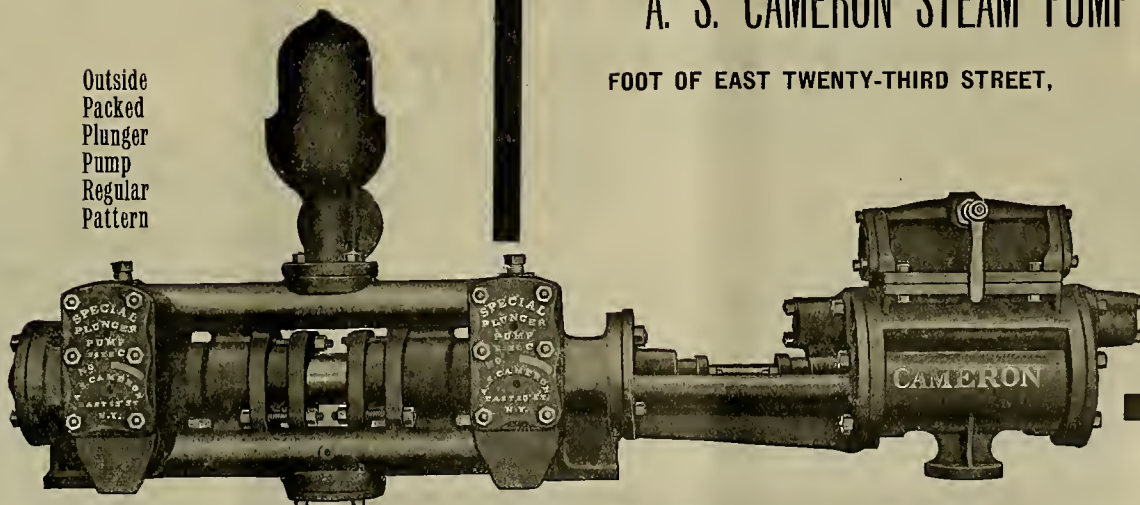
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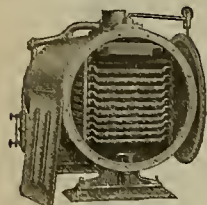
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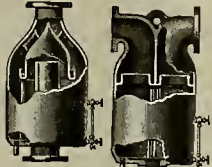


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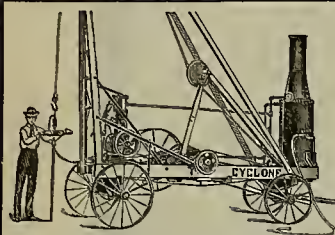
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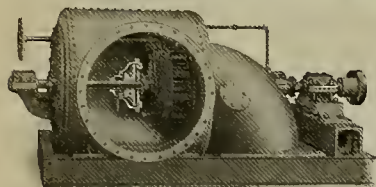
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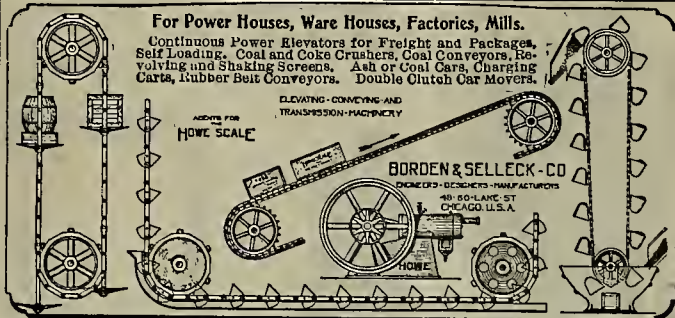
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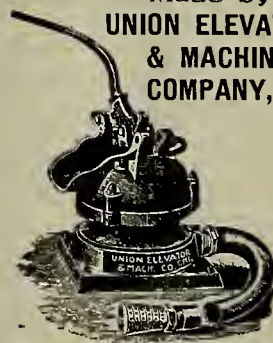
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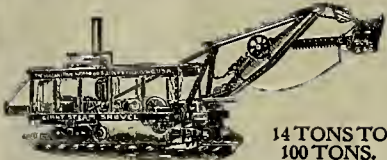
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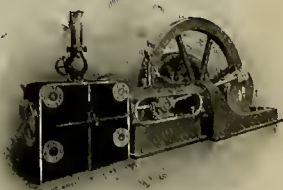
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## Improved Methods.

Although engineering features in mining have made many and radical changes in mining methods in the past, innovations continue to be made, and it is impossible to anticipate what new ideas may be introduced in mining within the next few years. The mine which is to-day being operated in an economical and thoroughly up-to-date manner may in a few years have introduced so many changes for the better that the methods now in use, and considered the best practice, will have become obsolete and "behind the times." This is the history of mining in the past, and it will undoubtedly be the experience of the future. An instance is found in the methods lately introduced in the Homestake mine, at Lead, S. D., where very large stopes are now mined with a minimum of timber, and still more recently in the Standard-Mammoth mine, in the Coeur d'Alenes of Idaho. In the latter instance the mine is developed by means of two tunnels having a difference in altitude of 135 feet. The portals of these tunnels are over a mile apart. Between them, and adjacent to the main shaft, a large ore pocket has been excavated with a capacity for holding several hundred



The First Quartz Mill in Tonopah, Nevada. (See Page 8.)



A House of Bottles at Tonopah, Nevada. (See Page 8.)



Hasbrouck Hoist, Gold Mountain, 6 Miles South of Tonopah, Nevada. (See Page 8.)



Lexington Hill Gold Mining Co.'s Mill Near Deadwood, S. D. (See Page 4.)

tons of ore. All ore broken in the lower workings is hoisted to this bin and automatically dumped. The chute gates are controlled by compressed air, and the latest devices have been introduced to insure rapid and safe work. The upper tunnel is used for the transport of men and materials only, while the lower tunnel is used for the conveying of ore to the surface. These changes have required months to bring about, and have been accomplished without interfering with the regular output of the property. The result is that mines which were formerly thought to be well managed have introduced new engineering features which have enabled the management to largely increase the output at a lower cost per ton than was possible under the former arrangement, which was considered excellent in its time. It is the constant aim to reduce expense, and it is sought to accomplish this by mechanical means, by taking advantage of situation, or in whatever manner appears possible. The result of this friendly rivalry among mine managers is a constant improvement in methods with lower costs.



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## Land Classification.

The classification of lands is one of the most difficult tasks that fall to the lot of those whose duty it becomes to undertake this segregation of mineral from agricultural lands in the western United States. Lands in the West may usually be classified under four general heads: Mineral, agricultural, forest, grazing and worthless lands. In some instances the desert lands, for the time being worthless, may later by irrigation become fertile and valuable as agricultural land. But to determine and set aside the lands "more valuable for mineral" from the other three classes, presumably more valuable for other purposes, is not an easy matter. There may be mineral indications on the surface, and yet the deposits of mineral be too superficial or low grade to yield a profit, while the land upon which it is situated is really valuable for agriculture or horticulture, or some other useful purpose. Again, land apparently valuable for agricultural purposes may conceal beneath its surface a mine worth many millions of dollars to whoever may care to exploit it.

From a humanitarian point of view, it has been asserted by some that any land which will raise a good crop of grain, vegetables or fruit is more valuable for these purposes than for whatever value it may possess as a possible producer of mineral.

Mines are made, and are usually years in the making; so it is clearly evident that to differentiate an undeveloped mineral occurrence from pastoral or agricultural land is often difficult. In view of these facts, it seems well to consider the advisability of setting aside all lands in mining regions and reserving them for mineral entry, regardless of their possible value for other purposes. Mineral lands command the highest price of any of the lands sold by the United States to its citizens, and it seems immaterial in what class they may eventually fall if they are originally purchased as mineral lands and in time prove to be worth more for agriculture, or other uses, than for mineral.

## Mining on the Rand.

During the first eleven months of 1904 the gold mines of the Witwatersrand, South Africa, produced 3,303,905 ounces of fine gold, and the total for the entire year based on the November production was probably not less than 3,640,000 ounces, or about \$75,000,000. This brings the production for a single year to a figure higher than any heretofore reached on the Rand. The highest output prior to the Boer war was reached in 1899, when it was 3,614,985 ounces, or about half a million dollars less than that for 1904. The experience of years on the Rand, the extensive development of the mines to great depth over a wide area, and the thorough knowledge thus obtained of the geology of the banket, its irregularities as to size, and varying gold content, have been of great practical value to the mine managers there. This experience has exploded some of the fallacies of the earlier period of mining on the Rand. The statements had so often been made that the banket could be depended upon to obtain a definite thickness over large areas, and that the values were practically even over these areas, that they became to be looked upon as expressing the actual condition prevailing there. It is now known that the banket is neither uniform as to thickness or value of the ore, and it has been demonstrated that the gold content shows a constantly decreasing average value with great depth. It is also proven that considerable areas of practically non-productive banket occur in some localities. Rich shoots of ore are developed in many places, and these shoots have been shown to possess definite characteristics, and proscribed limitations, not dissimilar from those found in veins.

Many experiments have been made in mining methods and in the treatment of the ores, and these experiments have resulted in the adoption of better and less costly mining. To some extent this also applies to milling. The milling methods, while in a general way similar to those practiced in the United States, do not accomplish as uniformly good results as in America. In the practice of the Rand large capacity per stamp is the one thing aimed at, and with this as high an extraction as possible from the material under treatment, while not reducing the tonnage capacity. The battery screens used are much coarser than is employed in many plants in America, and this, together with the heavy rapid-dropping stamps, gives the large capacity. The tailings, after amalgamation, are cyanided. In most instances the slimes and sands are separated before cyaniding, and the pyrite, which is supposed to carry the greater portion of the gold remaining in the tailings, is treated raw—that is, without previous roasting—and much of it is naturally coarse, due to the large mesh of battery screens employed.

The natural conclusion of one who had never actually worked on these ores of the Rand would be that finer crushing might reduce capacity, thus incidentally increasing milling cost per ton, but it should increase the amount of gold saved by amalgamation, and render possible extraction of gold by cyanidation higher than it is by the present practice. It is possibly true no higher net result may be obtained in this way, but a larger portion of the gold values would undoubtedly be recovered by employing a finer screen, necessitating finer crushing, and the mines would last longer than they will in the feverish haste to gain large capacity. If the ores were crushed through breakers or rolls to finer condition before going to the stamps the capacity would be increased with the present methods and the capacity would probably be as great as now if finer screens were used.

It is not unlikely that in the years to come, when the mines are beginning to show signs of being exhausted, as all mines, even the greatest do, sooner or later, that the tailings now rejected as valueless will be reworked for the values they contain, but which are not at present considered worth the cost. At the present rate of production the amount of ore annually mined and milled is about 8,000,000 tons, and the saving of an additional 10 cents per ton, even at the same profit per ton as now, would mean an additional \$800,000 in gross output. It seems a detail worth looking after, and if it can be done at no greater cost than now it will mean an additional profit of \$1,000,000 annually to the owners of those mines.

## Success in Mine Management.

To achieve success in mining, much depends upon the proper organization of the operative forces. The manager need not of necessity be able to "put in a hole," build a skip, or design a head frame or mill, but he must have that which distinguishes generals and the leaders of all great enterprises—executive ability. If he is not a practical workman himself, and has not had technical training, then, if he would be successful, he must surround himself with men who have these very necessary qualifications, for this is what the successful manager will always do, even though he has had technical training and practical experience, for he knows he cannot undertake the details of management. He is not omnipresent, and therefore cannot be in the mine or reduction works at the same time that his presence may be needed at the electric power station—situated, perhaps, several miles distant. The careful manager will not disdain to place the responsibility of superintendence of the several departments of the industry under his general care in the hands of competent men. He will require good men to look after the mining, mechanical, metallurgical, and probably electrical branches, and in some instances these several divisions are subdivided still further. There are men who have the destinies of a mining enterprise placed in their hands by their friends, who admire him for his success in merchandising and his strict integrity, but whose knowledge of mining amounts to nothing. In his new position there is often a strong temptation to undertake the entire responsibility of designing and ordering equipment, and the direction of all mechanical, engineering and metallurgical features—with what result the history of mining the world over affords abundant unfortunate evidence. A rich mine may possibly pay with any kind of management, but mines of this description are more rare than the over-confident but inexperienced managers.

## The Outlook.

There is at present a noticeable quietude in the camps of organized labor, and the outlook for a year of peace, as far as can be seen on the surface, is promising. In some directions, undoubtedly, legislative action in aid of unionized labor is anticipated, but it is doubtful if the position of those who favor the "closed shop," the "boycott" and "dynamite" can be materially strengthened in that manner. In times of industrial peace, such as now prevails almost universally throughout the country, the benefits derivable from such a state of affairs are clearly apparent and in strong contrast with the deplorable condition existing during the summer of 1904, when workmen and operators alike were arrayed in arms against each other. Both the workman and the employer each have rights which the other must respect, and it is hopeful that the present happy condition will continue for a long period. Under its benign influence investment in new enterprises is prompted, and the success which follows this is an additional incentive to new undertakings and the expansion of existing industries, while the opposite condition results in promptly retarding all contemplated new investment or stopping it entirely, while tying up for a time, perhaps permanently, those enterprises which are in existence, but which have not as yet reached a paying basis. It is an easy matter for the labor agitator to drive capital out of his district, and often it is done without thought or regard of the consequences to those most vitally affected—the workmen themselves.

**A**MONG the advances made in metallurgy the past year have been the successful introduction of the electro-magnetic separator for the treatment of gold ore in which zinc sulphide is a prominent constituent. Several attempts have been made to use petroleum and converter gas in the reduction of iron ores in blast furnaces of the ordinary type, but without the success anticipated by those conducting these experiments. A greater reward, however, attended the efforts to treat fine ore and flue dust from iron furnaces in Pennsylvania, by means of petroleum blast in a furnace of special design, and further experiment in this direction may result in making available a large amount of material heretofore practically lost. These experiments were conducted on new lines and with a highly heated dry blast.



## CONCENTRATES.

RUBBER packing for gaskets and other purposes cuts much more readily if the knife be frequently wet during the progress of the work.

A GOOD speed for a driving bolt is 3000 to 4000 feet per minute. In leather belts the direction of driving should be with and not against the laps in the belt.

THE strike of a vein is its direction horizontally. The trend of an ore shoot is its dip along the strike of the plane of the vein. The dip of the vein is at right angles to the strike.

WHEN a ton of quartz or other rock contains \$20 in gold, the gold represents one part in 29,166 parts, and if the value be but \$2 per ton, the gold represents but one part in 291,666 parts.

SOME mill men tie the wedges around the shank of a shoe with a string; others have the wedges tacked to a strip of cloth in order that they may be promptly adjusted when required.

FLUORSPAR is sometimes used in the manufacture of Portland cement. It is claimed to facilitate the semi-fusion of the finely ground material, thus forming what is known as "clinker."

IT is no more economical to run an engine with an underload than it is to run one with an overload. It is always wise to provide ample power, but the installation can be easily overdone.

CEMENT acts as a protector to iron and steel used in its reinforcement. Steel bars so used have been found with practically no sign of rust after having been embedded in concrete for over twenty years.

A CROSSHEAD for shaft sinking may be made of angle iron, and it would probably be as serviceable if not better than one made of wood. The plates could be riveted by the blacksmith. If the material is at hand it would probably be cheaper than wood.

NEARLY all copper ore deposits occurring at or near contact of limestone with other rocks contain garnet in abundance. The idea that the appearance of garnet is a sign of a poor mine is a fallacy, for some of the largest and most profitable copper mines are accompanied by abundance of garnet.

THE appearance of scattered but rich small pockets of ore in a large rock mass is not a safe indication that these deposits will be found to increase in size and number until a large, solid body of ore is formed in depth. Numerous stringers appearing at the surface sometimes unite to form a solid vein below.

THE frequent earthquakes being of late recorded in California are supposed to be due to the interior cooling of the earth, and the consequent shrinkage results in compensating movements of the outer crust of the earth—the rocks which may be seen in the hills and mountains in the workings of mines. All regions are likely to be similarly affected. Seismic disturbances occur in all parts of the world and are practically of daily occurrence.

A FATHOM is 6 English feet. Mine workings are not usually measured in fathoms except in Cornwall and a few places in the United States, where the custom has been introduced from England. A vara is a Spanish yard—32.8748 inches. It is often used to denote the extent of mine workings, and also of the superficial measurement of mining ground. In California, the legalized vara is 33.372 inches, and the legua (league) is 5000 varas, or 2.6335 United States miles.

THERE is a great difference in the manner in which different men fire a boiler. A careful man who has been properly taught, or who has learned from experience, will use much less fuel than another who either does not know or is careless, and consequently extravagant. Coal should be fired frequently and in even thin layers. Too heavy a charge will cause a prompt and decided lowering of temperature with a great increase of temperature as soon as the coal gets to burning brightly.

TO lay  $\frac{1}{2}$  mile of track (5280 feet of rails), using twelve-pound rails, will require about nineteen tons of rails beside fish plates, bolts, nuts, spikes, etc. If sixteen-pound rail is used, twenty-five tons of rail will be required. It is not necessary to use fish plates underground. Thousands of feet of track are in use in mines where no fish plates are in use. If the ties are heavy enough to use good-sized spikes, no fish plates are required. Where heavier tramping is done on the surface it is advisable to use fish plates on permanent tracks.

FUSE is known as single, double and triple tape, cement fuse, gutta percha fuse, etc. Each fuse is made in much the same manner—a thin and continuous string of powder surrounded by a wrapping of hemp or other material and covered on the outside by a single, double

or triple thickness of tarred tape tightly wound. In the case of cement fuse a composition impervious to water is substituted for tape, and gutta percha is only another variety of covering. In wet places or under water the best varieties of fuse should be employed.

THE duty of the miner's inch (1.5 cubic feet per minute) of water in moving gravel is variable, depending on the head and volume of the water used, and to a great extent upon the character of the gravel, and the grade, which may facilitate or retard the clearance of the gravel from the working place. The miner's inch varied so greatly in quantity, by reason of the variable head employed in measurement, that the California and Montana Legislatures fixed the amount at 1.5 cubic feet. Under a head of  $6\frac{1}{2}$  inches—that is,  $6\frac{1}{2}$  inches from the surface to the center of the orifice—1.53 cubic foot of water will flow in one minute through an aperture 1 inch square.

LOCOMOTIVE BOILERS are frequently seen about small mines, and sometimes at large ones. A boiler of this type is convenient, particularly in the smaller sizes, and is often mounted on wheels in order that it may be moved readily from place to place. For prospecting purposes, they are much in favor. The locomotive or firebox boiler is as extravagant of fuel as it is convenient, but its usefulness may be greatly increased if the feed water be heated and a damper be placed in the stack, in order that the combustion of the fuel may be controlled somewhat. This kind of boiler can be used to run hoists, pumps, quartz mills, saw mills and other machinery not requiring too great power.

THE largest number of stamps in operation under one roof is 300, in one of the mills of the Alaska-Treadwell Gold Mining Co., Douglas Island, Alaska. This company has another mill of 240 stamps. The gold output of Venezuela is difficult to arrive at, owing to high export duty, which acts as a sort of premium to smuggle gold out of the country. Official reports credit that country with a production of 41,200 ounces to as high as 49,000 ounces within the past ten years, with a probable average of about 43,000 fine ounces annually—or about \$8,600,000 during the past ten years. The annual output of Venezuela was considerably higher about twenty years ago, when the great Lode El Callao was being vigorously worked.

In pumping against a closed valve with a multi-stage turbine pump, or any other kind, the gauge should indicate a pressure equal to the total head necessary to raise the desired quantity of water. This depends upon the length of the pipe,  $L$ , its diameter,  $d$ , and coefficient of friction. The total head,  $H$ , is equal to the sum of the vertical lift,  $h$ , the friction head,  $h_1$ , and the velocity head,  $h_2$ . The velocity head is equal to  $\frac{v^2}{2g}$  where  $v$  is equal to the number of cubic feet discharged divided by the cross-sectional area; the friction head is  $f_1 \frac{L}{2g}$  where  $f_1$  is the frictional head for 100 feet of pipe of given diameter and for given velocity, obtained experimentally and given in hydraulic tables. The formula is  $H = h + f_1 \frac{L}{2g} + \frac{v^2}{2g}$ .

THE efflorescence appearing on the face of concrete walls is due to the seepage through the wall of moisture, carrying lime or other minerals in solution, which are deposited on the wall upon the evaporation of the water. This is usually observable along approximately horizontal lines, which represent the several stages of the successive days' work. It has been suggested that this may be prevented by giving the upper surface of each separate layer placed in the wall, a backward slope toward the rear of the wall and sprinkling a layer of neat cement on this upper, but unfinished surface. This forms a layer almost impervious to water and when moisture percolates downward through the concrete, on reaching these several impervious inclined planes, the water will be trained backward to the rear of the wall instead of to its face, and, in time, the soluble minerals will be completely dissolved and removed from the concrete.

THE thawing of nitro powder is always attended with danger, and too much care cannot be taken in this matter. When warmed, nitroglycerine oozes from the absorbent, and if it collects in a drop this drop is dangerous, for, falling on any heated object, will explode in the great majority of instances, and this explosion is likely to have the effect of exploding the main mass. Dynamite may be safely thawed in several ways. One, said to have been employed on the Croton Aqueduct work, was that of placing a cubical box 30 inches square within a box 48 inches square, the space between the boxes being filled with green stable manure packed hard. The boxes were set in a hole in the ground and filled round with 18 inches of loosely packed manure, the floor of the thawer being filled to a depth of 10 inches with tightly packed manure. The space above will hold conveniently fifty pounds of nitro powder. The cover had a stovepipe ventilator 3 feet high, and was provided with a sliding cover, to make access to the interior convenient. The sticks of dynamite were laid in loosely, the lid closed and green manure piled over it to the depth of a foot. The powder would thaw in from three to eight hours, depending on the degree of the tem-

perature outside. This method of thawing frozen nitro powder is safe; no rapid changes of temperature occur, and it is inexpensive.

GEOLOGICAL STRUCTURE has often a decided influence on the topography of a region. A fault may produce a cliff extending sometimes many miles. The contact between two formations often results in the erosion of a canyon along this line. Hard rock strata often produce ridges, and bosses of hard rock, rounded or rugged, isolated hills. Synclinal folds usually produce valleys, though not always, as the compression of rocks in a synclinal trough may render them so hard as to make them better able to resist erosion. The axis of an anticlinal is often indicated by a valley, as the rocks are fractured and thus rendered more easy of removal by erosion. The course of a vein is as often indicated by a line of depression as by a bold outcrop. The reason for this is due to the fact that the walls of a vein are often impregnated with the sulphide of iron which is disseminated in grains throughout the rock, often to a considerable distance on either side of the fissure. This renders the country rock much more easily susceptible to decay and oxidation of the sulphides, which facilitates erosion. Many other instances might be mentioned to show that geological structure has a very important influence on surface topography, like flows of lava over the country, which usually result in producing long, flat-topped ridges or table lands.

THE probable value of the ore which may be found at a greater depth than that exposed in a copper mine would be a difficult matter to satisfactorily determine. The engineer may be able to form a very fair judgment from what he can see of the probable continuity of the ore downward, but its value can only be guessed at. In many important copper mines the gossan is practically destitute; in the zone next below the iron capping the ore is abnormally rich, and in depth (in the normal sulphide zone) the ore is a low-grade mixture of copper and iron sulphide and gangue, and often also pyrrhotite and other minerals. The climatic conditions and topography of the country have much to do with the oxidation of the sulphide ores and the position of the various alteration products as related to the surface. Thus in a country where oxidation proceeds more rapidly than erosion a heavy iron gossan is not infrequently seen on the surface, while in a desert region, while oxidation may be more rapid than in a comparatively moist region, the rate of erosion is even more rapid and the iron capping is thinner or it is accompanied by the oxides and carbonates of copper, under which are found the enriched sulphides of which chalcocite (copper glance) and bornite (peacock copper ore) are examples. Beneath the zone in which these ores occur is the normal sulphide zone, but this may be deep seated, as at Clifton, Ariz. In many regions the normal zone is found within 200 feet of the surface. Although the greater portion of the zone of mineralization is above 1000 feet from the surface, there are places where the zone of enrichment extends to greater depth and many hundred feet below the level of the ground water of the district. In some mines there is practically no zone of oxidation or enrichment, which is probably due to climatic and topographical conditions.

CYANIDE SOLUTIONS are decomposed to a greater or less extent by many mineral substances commonly occurring in ores. The solution affects almost all of these substances more or less, and is itself affected by them, but the success of the process is based upon the fact that gold and silver in minute particles are more readily affected than are the other minerals usually occurring with them. Pyrite affects cyanide to a slight degree. Metallic particles of iron and steel which result from the crushing of the ores are disseminated throughout the mass of ore treated and dissolve slowly in cyanide solutions. Metallic copper is also slightly soluble in the solution. Copper sulphides usually accompany gold and silver ores, being present from a trace up to rich ore of copper. All the copper sulphides are soluble in cyanide solutions, but some more so than others. The presence of other mineral substances often facilitates the dissolution of copper ores in the cyanide solution, as many interesting reactions take place. The best way to determine the amount of cyanide consumed by the presence of particular substances is by test. Chemical analysis only cannot be relied upon to give the desired information. Mispickel (arsenical iron sulphide) is acted upon by cyanide, but very slowly. Some gold ores containing abundant arsenical sulphide have been successfully treated by the bromo-cyanide process. Stibnite (antimony sulphide) decomposes cyanide readily, and is one of the most objectionable substances with which cyanide operators have to deal. Owing to the reactions which take place in the solutions, gold and silver are sometimes rendered practically almost insoluble in cyanide solutions. Mercury, which is usually present in tailings, is soluble in cyanide. Some operators claim this metal aids in the process, others say it is a detriment. This must be considered as representing the individual experience of these several operators, and neither statement accepted as positive in all cases. Zinc sulphide is not considered as very disadvantageous if the mineral is fresh from the mine and has not had long exposure to oxidizing influences. Galena (lead sulphide) is similar in its action to zinc sulphide, and is not particularly objectionable to the cyanide operator. In each of the instances here mentioned special tests must be made to determine the amount of decomposition of cyanide by these several minerals.



## Important Mines Near Deadwood, S. D.\*

Written for the MINING AND SCIENTIFIC PRESS.

There are no mines within the corporate limits of the city of Deadwood, although a good portion of the town is built on worked-out placer mines which paid handsomely during the years from 1876 to 1878. Though surrounded by large and rich mines and ore deposits, none of these occur, so far as known, within half a mile of the town, the nearest being the Montezuma and Whizzers, operated for the iron pyrite which occurs abundantly in the great lode on which these claims are located. These mines have been extensively drawn upon to furnish sulphide material for the pyritic smelter of the Golden Reward Co., in which are treated the siliceous ores obtained from mines near Terry Peak. These flux mines are owned by J. T. Gillmore & Co. of Deadwood. The ore deposits occur associated with a heavy reef of quartzite, which can be traced for many miles over the hills to the southeastward from Deadwood creek, but which passes beneath the lower member of the overlying Cambrian rocks half a mile away to the northwestward. This zone is 40 to 100 feet in width and carries chiefly pyrites, with a little chalcopyrite in the quartz gangue. The inclosing walls are mica schist, hornblende schist, etc.

Although there are represented within the city limits of Deadwood all of the several geological horizons at which ores occur in the Cambrian, Silurian and Carboniferous formations, within the Black Hills, there are no ore deposits of value known to exist in these rocks in this town. The Cambrian exposures are complete from the basal quartzite to the upper quartzite, distinguished by the abundant appearance of the fossil *Scolithus*. The Cambrian formation has a thickness here of about 450 feet, but thins out southward until in the southern Black Hills, near the south fork of Castle creek, it is not over 50 feet in thickness.

Overlying these Cambrian quartzites, shales and glauconitic sandstones are the calcareous shales and limestones of the Silurian and Carboniferous. The presence of the Devonian has been questioned, but the writer is of the opinion that fossils found on the eminence just east of Deadwood, locally known as White Rocks, identify the Devonian horizon.

It is in these sedimentary beds that the gold, silver and lead-bearing deposits which have attracted so much attention of late years occur, and which are generally referred to as the "siliceous ores," to distinguish them from the ore found in the Archaean schists upon which these sedimentaries rest.

All about Deadwood, particularly to the east, north and west, eruptive rocks of several types have been intruded into the Archaean and overlying sedimentaries, but these occurrences, known to be favorable to mineralization and the formation of valuable ore bodies, are not always accompanied by deposits of ore of commercial value. To the eastward of Deadwood, however, in Spruce gulch and on the divide between Spruce gulch and Two Bit creek, there are extensive and valuable ore deposits occurring at several horizons in the Cambrian and later formations. In the basal member, the Quartzite, occurs lead-silver ore; about 200 feet higher, lead carbonate ore is found in glauconitic red sandstone, and gold also is found in loosely coherent coarse sand rock, and in a dense, hard siliceous limonite. Ore deposits are known in and near the upper quartzite, and a chimney of gold-bearing iron ore is found in the carboniferous limestone on Lexington hill. Beside these several ore-bearing horizons, there are numerous zones in which occur "stocks" of iron oxide (presumably oxidized pyrite) in the porphyry intrusions. Ore deposits of this class are numerous on the divide between Spruce gulch and Two Bit, and similar occurrences are known near Galena and in the Bald mountain district.

The Spruce gulch section is rugged, and, owing to the numerous faults and porphyry intrusions, the geological structure is somewhat complicated, and an understanding of it is rendered more difficult by the large amount of talus which often obscures the rock formations. In this region one of the principal properties is that of the Lexington Hill Gold Mining Co. Originally this company owned the single claim known as the Old Lexington, at the summit of Lexington hill, on the divide between Spruce and Two Bit gulches, a mile and a half east of Deadwood. The Lexington Hill Co. consolidated the properties of five separate corporations, and their holdings are now among the most extensive controlled by a single company in Lawrence county. The area of mining ground thus consolidated is 350 acres. The greater portion of the ore is found in the Cambrian shales and quartzites. Thus far, five separate ore-bearing horizons are known. The formation is much disturbed in places and the ore beds are found lying at all angles, from nearly horizontal, as in the Champion mine, to about 60° pitch, as in the Annie. In the early days of the district the Champion was the most extensively worked of any of these mines, and many thousands of tons of good ore were milled in an ordinary stamp mill in which simple amalgamation was the only practice. This was done in the years about 1879 to 1882. There were

frequent stoppages, when neither mine nor mill were operated for months at a time. This is not surprising, for the mill men were at their "wits' end" how to save the gold. Cyaniding was unknown, and chlorination, though commonly practiced elsewhere, had never been introduced in the Hills. The old mines are a labyrinth of shafts, winzes, levels and irregular excavations from which the ore was taken. Much of this ore was high grade, running from \$15 to \$200 per ton. The average, however, was much below this. Ore from \$5 to \$20 per ton is abundant. The development work was done in a random, haphazard fashion, in search of high-grade ore, but the present company has introduced a system of development which will greatly facilitate mining and cheapen its cost.

The accompanying illustration is that of the Lexington Hill mill in Spruce gulch, about a mile from Deadwood by road. A tunnel has been driven into the hill back of the mill, as shown in the illustration on the front page. This tunnel is started below the lowest Cambrian stratum, and will be run 3000 feet to a point under the crest of Lexington hill. This cheapens mining, as all ore broken above the tunnel level can be handled by gravity.

The milling process is by amalgamation, concentration and cyaniding tailings. The average value of the ore is stated to be \$6 per ton.

## The Bassick Mine, Querida, Colo.

One of the most interesting mines in Colorado is the Bassick, near the town of Querida, in Custer county. The remarkable ore shoots of this property occur in an agglomerate of andesite within a rudely elliptical fissure, or vent, which at the surface was 20 to 30 feet in width and 100 feet long. It extends downward almost vertically, but winding somewhat. It is a typical pipe or chimney. It is practically without walls, and there is no line of demarkation between ore and barren country rock, the values disappearing by gradual transition from rich silver-gold ore to that which is commercially worthless.

Within the zone of fracture which some presume to be a volcanic vent, though this is unlikely, the fragments of the breccia or agglomerate range from that of pebbles to boulders 2 to 3 feet in diameter. These



Ore Shoots Bassick Mine, Custer County, Colo.

fragments are rounded, or subangular, few having sharp edges. Its condition varies from soft, earthy and crumbling, to dense, hard and flinty. At times boulders of the secondary silica are found embedded in masses of kaolin. The remarkable fissure has maintained its structural characteristics to a depth of nearly 2000 feet from the surface outcrop.

The richest ore occurs in the central portion of the deposit, the values generally lessening as distance from the center of the mass increases. It is a curious fact, also, that the average size of the fragments of rock (andesite), at the center are larger than those in the zone surrounding it.

The mineral composition of this unusual type of ore deposit is as peculiar as its structure is uncommon. There is in this deposit neither calcite, heavy spar, nor any other of the spar minerals that are generally found associated with ore deposits. The minerals occurring in the deposit are chiefly the sulphides of zinc, and lead, antimony and copper, with the secondary minerals resulting from their alteration in the upper or oxidized portion of the deposit. These

minerals are the carbonates and silicates of the base sulphides, together with tetrahedrite (gray copper), silica, gold and silver.

These minerals were found arranged in concentric shells or layers, around the boulders of the deposit. The shells are of about the same thickness and follow each other in the same order on all of the boulders, there being generally three and sometimes four separate layers observable. From within outward, they occur as follows:

First. A thin layer of the sulphides of antimony, zinc and lead, black in color, with metallic lustre and crystalline structure. This layer varied from a thin line to  $\frac{1}{2}$  inch in thickness, and carried from 1 to 3 ounces gold and 60 ounces silver per ton.

Second. A layer of lighter color, in which there was a larger amount of lead, silver and gold than in the layer underneath it, and running sometimes 100 ounces gold and 150 to 200 ounces silver per ton.

Third. A layer of crystallized zinc blend, containing also some iron and copper. It was from  $\frac{1}{2}$  inch to 2 inches thick, carrying 15 to 50 ounces gold and 60 to 120 ounces silver per ton. Owing to its relative abundance, this layer constituted the most valuable source of revenue in the mine.

Fourth. When it was present, this fourth shell consisted chiefly of chalcopyrite. In thickness it varied from a few grains scattered on the outer surface of the blende to  $\frac{1}{10}$  inch. It contained 50 to 100 ounces gold and silver.

Fifth.—Outside of this there occasionally appeared a thin sprinkling of pyrite. Strangely, this mineral, usually so abundant in ore deposits, occurs sparingly in the Bassick mine. Among the larger boulders the filling was generally kaolin. The mineral comprising the first, or inner shell, of the larger masses was always found present, as it covered the smaller pebbles and cobbles, whether the other shells occurred or not. It is a combination of antimonial lead. The zincblende layer, which is so pronounced in the heart of the ore body, is entirely absent in the outer portions of the deposit.

The gray copper was always found associated with quartz and outside of the shells in the interstitial spaces between the boulders. Quartz is also found in the open spaces between the boulders and never as a portion of the shells.

A curious fact in connection with this mine is the finding of fragments of charcoal to a depth as great as 765 feet. The charcoal often was found to have fine crystals of pyrite scattered throughout its pores.

Charcoal is also found in some portions of the Comstock Lode hanging wall, at Virginia City, Nev., and in the mines of Bodie, Cal.

These several occurrences of charcoal several hundred feet from the surface have been thought to be due to the fact that there have been several periods of eruption of the andesites, and that the interval between them was sufficiently long for trees to either grow on the surface of the flow or tufa deposit, or to be carried there by some means, and that the tree was enveloped in the next succeeding flow or deposit, to be, in time, converted to charcoal. This theory, if accepted, indicates the probability that the Bassick ore deposits have occurred at the joining plane of two separate deposits of fragmental andesite, or that the wood from which the charcoal was formed was involved in the andesite tuff or breccia in some manner, to be later turned to charcoal.

The origin, or genesis, of the Bassick ore deposits has been the subject of much speculation and a great deal has been written on the subject. Among the theories advanced are that of an "active volcano," where the rocks were ejected, falling back into the vent only to be again ejected, thus, in time, becoming rounded, like washed boulders.

This explanation will not account for the several peculiar structural phenomena observed. Had the rocks been ejected as suggested, only to fall back to be again ejected, until they finally came to a state of rest by reason of decrease of volcanic force from below, they would have lain in immediate contact with each other. This is not the case, however, as the boulders do not touch, and no known force could have kept them suspended in air, as it were, until the sulphide mineral shells had been deposited to fill the spaces between.

The more reasonable supposition is that the deposition of mineral is due to thermal springs rising from depth and carrying the minerals in solution found in the deposit. This mineralization took place along a line of fracture, somewhat illy defined, it is true, but probably having a direction common with the major axis of the ore body. The rings or shells of mineral deposit seem to be due to the concentric decomposition of the andesitic boulders themselves, a phenomenon not at all uncommon in the weathering or alteration of many massive rocks. The concentric shells were replaced by the mineral solutions, in much the same manner as metasomatic replacement occurs, in bands within fractured zones, elsewhere. As to the relative age of the several shells, that seems more difficult of solution. The natural inference is that the outermost shells, being the first to suffer alteration, were also the first to be replaced by the minerals of the sulphides coming from below.

It seems, without doubt, that the ore deposits of the Bassick mine are due to the last active evidence of volcanic action in the form of a fumarole or hot

\*See illustration front page.



spring, possibly accompanied by hot water and the escape of steam at the surface.

The peculiar mineralization of the deposit may be due in part to secondary causes. There are other deposits in that portion of Colorado not wholly dissimilar, and these occurrences throw much light upon the origin of ore deposits in zones of fracture and brecciation.

## The Genesis of the Copper Deposits of Clifton-Morenci, Arizona.

NUMBER II.

Written by WALDEMAR LINDGREN.

The Longfellow limestone, though somewhat irregularly altered, is, next to the contact, generally transformed into a coarsely granular rock of garnet, epidote, diopside, magnetite, pyrite, zincblende and chalcocopyrite, and there is a most decided change of composition, chiefly consisting in additions of silica and iron. Other parts are less altered, but contain much magnetite, together with the sulphides mentioned, disseminated through a medium-grained crystalline mass of the carbonates of lime and magnesia. The development of magnetite, metasomatically, is a most pronounced feature of the process. Looking at the formation as a whole, sulphur, iron, copper and zinc have certainly been added, and probably also silica and magnesia. Large masses of magnetite,

The metasomatic development of magnetite in pure limestones which has recently been questioned by Prof. Klockmann may be observed in almost countless localities at Morenci and Metcalf, both in the field and under the microscope. It is known that iron was not contained to this extent in the original rock, but to demonstrate its actual derivation in each case is, of course, difficult. The question becomes clear only when we compare the contact zone as a whole with the original unaltered rock.

It seems very strange than any one can doubt the possibility of such conditions and overlook what must happen when a magma in aqueous fusion is suddenly brought up to higher levels and strongly ionized water-gas above the critical temperature is largely released from its bonds. It must of necessity contain dissolved substances. Even at comparatively low temperature water is one of the most powerful solvents known, and its action, when a perfect gas, is probably far in excess of that at 100° or 200° C. It is well known that some rapidly congealed rocks, like the "pitch stone" from Saxony, contains up to 8% of water, which indicates an amount of water-gas which per cubic meter of magma would at + 4° C. correspond to from 250 to 300 liters. All magmas may, of course, not have contained this amount. The water-gas seems to have penetrated the limestones like a sponge, inducing extreme molecular mobility. Even should we deny any additions of substance, a most remarkable transferring of substance has certainly taken place in the rock, as shown, for in-

pyritic veins are of low—generally unpayable—tenor; they consist of prevailingly granular or massive, very rarely crustified, minerals with a little quartz-gangue, and are believed to have been formed by pyritic replacement along well-defined fissure planes. In the porphyry these veins are surrounded by very wide zones, in which the rock is greatly altered by the introduction of sericite and pyrite, and this applies to Metcalf as well as to Morenci. At the latter place, almost the whole of Copper mountain, containing the most important lodes, is thus altered. The process, which in the complete report is elucidated by many analyses, produces bleached rocks of varying hardness, in which all of the feldspar has been replaced by sericite and some pyrite. The biotite and hornblende are transformed into chlorite and serpentine, while the silica of the rock remains almost constant. All of the lime and soda are eliminated, while potash is greatly increased; no carbonates form during this process.

RELATION OF CONTACT AND HYDROTHERMAL METAMORPHISM.—The alteration of limestone along fissure-veins to tremolite (or diopside) with magnetite and sulphide is, as far as I know, a novel one. Ordinarily, limestone alters next to fissure-veins to dolomite or quartz or jasperoids. The addition of silica and iron and the mineralogical result of the hydrothermal process at Morenci undoubtedly connects it in some way with contact metamorphism. It is also probable that an alteration of this kind took place at high temperature comparatively soon after the



Arizona Copper Co.'s Works, Clifton, Ariz.

locally used as a flux, have been mined at this horizon.

The Morenci shales have suffered a change to dense, greenish hornfels with a development of amphibole and, in places, also muscovite. Pyrite and magnetite are also present, but on the whole the change in composition is probably slight.

The Modoc limestone, containing about 96% of carbonate of lime, has proved extremely susceptible, and over large areas at Morenci, as well as at Metcalf, is converted to a massive sheet of lime-iron garnet; magnetite is usually present; epidote and oxidized copper ores are also of frequent occurrence. This transformation, involving large additions of silica and ferric iron, is very noteworthy, as the evidence is entirely uncontrovertible.

The contacts of the sedimentary series and the porphyry are sharp and show no evidence of assimilation. All of the contact metamorphic rocks, when unaffected by oxidation, are very compact and hard, atmospheric waters finding great difficulty in attacking them. Considering that great amounts of carbon dioxide have been expelled during the metamorphism, it is clear that a great shrinkage of volume should have taken place if no additions of material had been received. Such a reduction of volume has evidently not taken place, and I believe that any loss has been fully balanced by gains from material contained in magmatic solutions.

Study of the Morenci contact zone proves conclusively that important accessions of substance have been received. The rocks inside the altered zone contain an enormous quantity of sulphur, iron, copper and zinc. Iron is contained in the unaltered rocks to some extent, but nothing like the quantities in the contact zone; sulphur, copper and zinc in noticeable amounts are absent from the unaltered rocks. Were they present, to the extent of a small fraction of the percentage contained in the contact-zone, direct observation and surface oxidation would expose their presence. The minerals in which these substances are contained were certainly formed contemporaneously with the ordinary contact minerals of the district, like garnet, diopside and epidote.

stance, by large crystals of garnet developing in limestones of uniform composition containing far less silica than the amounts required by the newly formed mineral.

A misapprehension of the character of contact deposits seems to exist in many quarters, in considering the presence of minerals containing boron, fluorine, etc., as necessary to prove the contact-metamorphic character of these deposits. The character of magmatic waters evidently varies greatly in different magmas. Some may carry large quantities of the substances mentioned, as shown by the presence of tourmaline, cassiterite and other minerals in the contact-metamorphic rocks, while others may be almost wholly deficient in them, and, instead, carry sulphur, copper, iron and other metals. In the Clifton group of deposits, I would be inclined to consider molybdenum a characteristic constituent, taking the place of tungsten in the tin deposits. Any attempt to reduce the wonderful variety in the contact-metamorphic deposits to a single pattern is doomed to failure.

As the result of wide observations, we would state, as far as we know at present, ore deposits may occur several hundred or even 2000 feet away from the contact. In fact, disseminated sulphides and magnetite occur at Morenci up to 2000 feet from the main contact.

A tabular form of deposits often noted is usually due to the strongly marked difference in susceptibility of the various beds. Wherever the deposits have been enriched by oxidation, the form may be more or less dependent upon these changes.

W. H. Weed has noted the tabular shape in contact deposits at Cananea, Mex., and makes the form a basis of classification. I do not believe, however, that distance from contact (within limits given above) and shape are at all essential, and can find no mineralogical difference between deposits varying in these respects.

HYDROTHERMAL METAMORPHISM.—Both the porphyry and the contact zone are traversed by fissure-veins, which carry pyrite with a small quantity of chalcocopyrite, zinc blende and molybdenite, whenever oxidation has not changed these minerals. These

solidification of the porphyry.

The vein alteration produces dull, earthy rocks from the limestone, while contact metamorphism results in hard, compact and granular rocks. On the other hand, there is undoubtedly a certain relation between the two processes, for amphibole (and pyroxene) occurs in the true contact-metamorphic rocks, and the intergrowth of magnetite and pyrite is characteristic of both. I should, therefore, conclude that after the completion of the contact metamorphism, properly speaking, and after the consolidation of the porphyry, an extensive fissure took place and solutions derived from the cooling porphyry, probably ascending and laterally extending from this rock, flowed through these fissures. Everything indicates that these solutions were closely related to those which emanated from the magma at the moment of intrusion and, in fact, similar in general composition.

PROCESSES DUE TO OXIDATION AND HYDRATION IN THE ALTERED ZONE.—Under influence of surface waters, but protected from direct oxidation, chlorite and serpentine form from the tremolite and diopside of the contact zones, while garnet is little altered. Under direct oxidizing action, garnet changes to limonite and quartz, while lime is probably carried away as carbonate. Tremolite and related minerals are similarly affected. Magnetite oxidizes to hematite and limonite, many large bodies of which are mined for fluxing purposes.

The veins are marked by siliceous outcrops, either entirely barren or containing small amounts of oxidized copper ores. No basic ferric sulphates have been seen either in the mines or on the surface. The waters percolating downwards must soon have lost their oxygen and, for the alteration at greater depths, ferrous sulphate and diluted sulphuric acid are probably the only reagents of importance resulting from the pyrite. It is clear that the upper part of the veins have not been formed by simple oxidation of pyrite and accumulation of limonite.

Direct oxidation of chalcocopyrite yields cupric and ferrous sulphates, while the zinc blende produces zinc sulphate; both of these processes are in evidence wherever disseminated sulphides in the meta-



morphic rocks are exposed to oxidation. The general order of attack of oxygen is usually stated as follows: Arsenopyrite (most easily attacked), pyrite, chalcopyrite, blende, galena and, finally, chalcocite (most difficultly attacked). This rule is probably true only for one set of conditions as to mass, aggregate and character of solutions. Very marked exceptions from it occur at Morenci.

**SULPHATE WATERS.**—Descending waters from a lode of decomposing pyrite, chalcopyrite and zinc blende should contain chiefly ferrous, cupric and zinc sulphates, together with free sulphuric acid. The first two salts are easily soluble, but far more so is the zinc sulphate.

Cuprous sulphate is stable only under certain conditions and is not believed to be an important reagent, though it may form during subsidiary or intermediate reactions. Its presence in any mine waters has not been satisfactorily proved.

In this district, some moisture percolates the upper workings, as shown by efflorescences and stalactites of sulphates, but the mines are practically dry. In the porous porphyry, the moisture spreads easily, while the hard metamorphic rocks offer considerable resistance.

**PROCESSES IN FISSURE VEINS.**—Below the region of oxidizing influences, the veins consist of pyrite, chalcopyrite and zinc blende, while the upper few hundred feet contain chalcocite and oxidized copper ores. The most important action of the descending sulphate solutions has been a development of chalcocite by the action of cupric sulphate on primary pyrite ore; this process began at the time the veins were first touched by oxidizing waters, and continues to some extent to the present time.

**OXIDATION OF CHALCOCITE.**—After a large part of chalcocite in the lode had been formed, there came a time when erosion and degradation, working faster than oxidation, began to expose the upper part of the chalcocite zone to active and direct attack by oxygen. Practically all of the veins are in this stage. The present zones of active oxidation are therefore due, not to direct oxidation of the primary lode, but to the destruction of the upper horizon of the chalcocite zone. As reagents, there are here ferrous sulphate, sulphuric acid, cupric sulphate and free oxygen. Any ferric sulphate present would soon be reduced to ferrous salt by the abundant pyrite. Chalcocite changes to cuprite and cupric sulphate, sometimes with an intermediate stage of covellite. Cuprite, partly reduced to metallic copper, is abundantly present in the upper limit of the chalcocite zone.

By some process not quite elucidated, chalcocite may, in places, change directly into native copper. The zone of cuprite and metallic copper has rarely great vertical extension, for the reason that both minerals are rapidly converted into cupric sulphate, brochantite, malachite, azurite and chrysocolla; but these products are soon dissolved by free sulphuric acid from pyrite, some of which tenaciously remains until the last, and descend as soluble sulphates to enrich the upper part of the chalcocite zone.

**OXIDIZING PROCESSES IN LIMESTONE.**—The processes which have resulted in the oxidized deposits now forming irregular or tabular masses in limestone or shale, and not connected with fissures, are materially different from those occurring in the lodes. In most cases the original material consisted of disseminated lean pyritic ores, containing pyrite, chalcopyrite, zinc blende and magnetite, locally more or less concentrated in irregular masses, or following certain strata or dike contacts. Free oxygen and sulphuric acid, ferrous and cupric sulphates, with an abundance of calcium carbonate, formed the reagents. Though oxygen and carbon dioxide may in part have produced limonite and malachite directly from pyrite and chalcopyrite, the most important reactions doubtless were those between calcium carbonate and sulphate solutions, partly derived from nearer the surface.

In the first case malachite, in the second azurite forms, together with gypsum. The latter mineral, though largely carried away in solutions, is not uncommon in these deposits at Morenci. Ferric hydrate will be produced from ferrous sulphate and calcium carbonate. Thus, in general, is explained the constant occurrence in these deposits of malachite, azurite and limonite. Crusts of replacing malachite and azurite frequently surround residual, rounded masses of limestone. The gangue of garnet and magnetite alters to ferric hydrate and quartz. Chrysocolla forms when silica is plentiful; zinc minerals are not uncommon in these deposits, and efflorescences of the zinc and magnesia sulphates sometimes cover the tunnel walls. During the process outlined above, lime is almost wholly eliminated, while alumina forms residual concentrations.

**OXIDIZING PROCESSES IN SHALE.**—Disseminated cuprite in beds of Morenci shale is a common occurrence, and some of the large ore bodies of the Manganese Blue mine were of this character. It occurs as flakes on the bedding planes, or in small replacement veins, sometimes accompanied by distinctly later malachite and by limonite.

Azurite also occurs frequently in shale, as shown by the second ore body in the Detroit mine. Large crystals of that mineral develop here, metasomatically, in a metamorphic shale, composed of sericite

and amphibole. Cases have been observed where azurite envelops masses of undecomposed pyrite accompanied by a little limonite. During the oxidizing process, the alumina possesses considerable mobility. It is dissolved by sulphuric acid from clay shale and by decomposition of certain aluminous minerals, notably sericite. The aluminum sulphate formed is extremely soluble in water, and thus easily transported. At many places in the mines of Morenci, pure kaolin forms, together with azurite and malachite.

(TO BE CONTINUED.)

## Water Rights in California.

NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by  
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**HOW AN APPROPRIATION IS MADE (CONTINUED).**—The mere diversion itself without the intent to apply the water to a beneficial use will not, of course, be enough; as where water is diverted merely to drain the bed of a stream so that it can be mined. (7 Cal. 261.) But when all requisites are present the right to the water dates back by relation, as we have seen, to the posting of the notice. (C. C. 1418). The actual application and use of the water may then follow, but need not do so immediately; the right is already complete, and the failure to make use of it within a reasonable time (130 Cal. 290 at 296) is only evidence of abandonment, to be considered hereafter. (115 Cal. 496, 60 Am. St. Rep. 806, note). There must, however, be apparent ability to apply and use it as intended; otherwise, though the construction work will be completed, there will be no bona fide intent to use it for a beneficial purpose, which, as we have seen, is also an essential. The absence of an apparent ability to use the water at completion is evidence against the bona fides of the intent (which must have a reasonable foundation), as in the case of gathering water in a reservoir for mere speculation. (15 Cal. 271.)

There having been a proper notice, a bona fide intention to apply the water to a beneficial use, diligence in the construction work, and an actual completion of it, the right is complete, and dates from the posting of the notice. (C. C. 1418).

**EXERCISE OF THE RIGHT.**—We now leave the questions arising out of the obtaining of water rights and take it as granted that a valid water right has been obtained by appropriation, as previously set forth. The inquiry now is as to the limits within which the water can be then used. The limitations to be considered are (1) those arising out of the nature of the right; (2) those concerning the manner of use; (3) concerning the amount used; (4) concerning the purpose for which used and the place of use.

1. The right is in the nature of a grant of favor or franchise from the Government to use the water (6 Cal. 548 at 558; 75 Cal. 464 at 483); that is, it is usufructuary solely. There is no property in the channel itself, nor in the water itself, nor in the natural flow. As there is no property in the channel itself obtained by appropriation, the same channel may be used by several appropriators, as where one man had appropriated water and a later comer above stream poured water into the channel and then diverted it again before it reached the former appropriator, thus using the channel as a link in a long ditch line (7 Cal. 46; 11 Cal. 143). The ownership of the channel remains with the Government. As, in the next place, there is no property in the water itself, the appropriator cannot sue for the value of water diverted by another, but only for the damage to his own use of it (57 Cal. 44). Nor can he set up any claim to water after it has left his ditch (3 Cal. 249), the water itself not being his, but only the use of it, which is what is expressed by saying that the right is usufructuary solely. As, finally, there is no property in the natural flow, it is held that, so long as one's ditch is filled, a later comer may change the amount of the natural flow by taking the surplus (13 Cal. 220), or an artificial flow is enough if one's ditch remains, nevertheless, filled as usual (113 Cal. 182 at 196)—without causing uncertainty, it should probably be added.

Though usufructuary solely, the right is in the nature of real estate. In 5 Cal. 445 the court says: "From the policy of our laws it has been held in this State to exist without private ownership of the soil, upon the ground of prior location upon the land, or prior appropriation and use of the water. The right to water must be treated in this State, as it has always been treated, as a right running with the land, and as a corporeal privilege bestowed upon the occupier or appurtenant to the soil; and, as such, has none of the characteristics of mere personality." They held that a justice of the peace had no jurisdiction over an action for diversion of water, because it was an action concerning real estate.

It may become appurtenant to the land for which it is used, if any, and in such case passes with it as an appurtenance, if appurtenances are mentioned in a sale (47 Cal. 453; 93 Cal. 365; 75 Cal. 464), for "it can be transferred like other property" (13 Cal. 220 at 233). A sale of it requires a writing, because, being an interest in realty, it is within the statute of frauds (Griseza vs. Terwilliger, 28 Cal. Dec. 313). The

statute of limitations concerning land applies to it (25 Cal. 504).

But the water right is not held like land, absolute, in the full sense; it is held subject to conditions owed to the Government, from whom it is at the start obtained, the chief of which conditions is that it must be continually used for a beneficial purpose. An illustration of this condition of beneficial use, under which a water right is held, occurred in the very recent case of Griseza vs. Terwilliger, 28 Cal. Dec. 113. It was there held that a verbal sale would not pass a water right, as it is an interest in land requiring a writing; but it was held, at the same time, that it would be taken as evidence of an abandonment, signifying an intention to discontinue applying it to a beneficial purpose oneself, as the Government requires. It was even hinted that it was an abandonment ipso facto, which harsh result is not one of the usual consequences of a parol sale of real estate, nor, for example, of a parol sale of an unpatented mining location (51 Cal. 258). If the head note, in the "Decisions," to the Griseza case correctly represents the decision of the court to this effect, then the statement in 13 Cal. 233, that it can be transferred like other property, must be taken with limitations, and the owners of water rights would be in danger of losing them entirely by a parol sale or a faulty deed. At all events, it shows again that there is no title to the water itself; but the right is usufructuary solely.

2. Manner of use: It has been said that the appropriator may use the water in any manner necessary to carry out the use for which it was appropriated (46 Cal. 218). It is a rule applying to all branches of the law of waters that whether the use is by water wheels, taking it by pumps, using it in steam boilers, etc., makes no difference (111 Cal. 473). Under Sec. 1415 civil code, the means by which water is diverted may be changed later, so long as others are not injured by the change. The only important limitation upon the manner of use is that the water must not be used wastefully, for then it is not all used, for a beneficial purpose, as is necessary (C. C. 1411; 132 Cal. 312; 112 Cal. 230). This is the same under the doctrine of riparian ownership, also; e. g., in one case a riparian owner built a dam, spreading out the water over a flat for cattle to wallow in, so that much was lost by evaporation. He was stopped by a writ of injunction (28 Cal. 340).

The use by means of ditches and flumes is, of course, the most usual, and using it in this way does not, by any means, make the appropriator an insurer of others against accident from breaking ditches or overflows. There is a famous English case (Fletcher vs. Rylands, L. R. 3 House of Lords, 330) declaring that a man builds a reservoir, etc., at his peril. But such is not the law in California (10 Cal. 413; 35 Cal. 679). Nor does such a break or overflow in itself prove that the ditch owner was negligent; or, as it is said, it is not a case of "res ipsa loquitur," and negligence is not presumed (7 Cal. 335). The owner is liable only if the break or overflow occurred through his negligence, a failure to use the care which an ordinary prudent man would have taken with that ditch (10 Cal. 541).

3. Amount of Water: Before the code the appropriator could take to the full capacity of his ditch, having a reasonable time, after its completion, to remove obstructions, rocks, etc., and to remove other things causing an irregularity of flow. (8 Cal. 443). He was limited to that, however, and could not take more later, unless by a new appropriation. (13 Cal. 33; 21 Cal. 374). Under the code he must state in his notice how many inches of water he appropriates, and will be limited to that (C. C. 1415), or, if he uses less than that, to the amount actually used. (112 Cal. 230; 120 Cal. 86).

The surplus over what he has appropriated may itself be appropriated by later comers. (13 Cal. 33; 120 Cal. 86).

4. Place and purpose of use: Under the code, the place and purpose of use must be stated in the notice (C. C. 1415). What constitutes a proper purpose has already been considered under the question of intention, and it need only be inquired here what changes can be made in place or in purpose of use, without a new appropriation.

As to change of place of use: It was early decided that the place of use may be changed without loss of priority. It was absolutely necessary in the early mining days, when new ground was being continually opened up. In 7 Cal. 261 it was held that branches could be run to new mining claims without loss of priority, and that the main ditch itself could be extended to new localities. In 15 Cal. 161 it was held that the point of diversion or taking of the water could likewise be changed. The only limitation recognized on change of place by these cases and the cases following them was that others must not be injured in making the change. These rules are now incorporated in the civil code, Sections 1412, 1415.

As to change of purpose: This was at the start treated as a distinct question from change of place (e. g. 7 Cal. 261). It was urged in several cases that the right was limited to the purpose for which first appropriated and that a use for a new purpose could be obtained only by a new appropriation. This view obtained some footing in the early decisions (e. g. 13 Cal. 33, 21 Cal. 374). But it never took a firm hold. In 13 Cal. 220 it was held that use for a saw mill



could be changed to use for a grist mill, and in 32 Cal. 26 it was said (obiter) that use for placer mining could be changed to use for quartz mining without loss of priority. The more recent cases are in this line, though they do not go into the question closely. They disregard any distinction between change of place of use and change of purpose of use. It seems established that the rule now is that there is no limitation on either change of place of use or change of purpose of use, so long as others are not injured by the change (96 Cal. 214, 101 Cal. 242, 108 Cal. 72), though it should be noted that only change of place of use is specifically covered by the civil code.

That the place of use may be upon distant lands is one of the characteristic features of the law of appropriation.

**PROTECTION OF THE RIGHT.**—We have been considering, up to the present, what the appropriator has a right to do. Now it is proper to consider what he has a right to complain of; that is, what constitutes an infringement of his right by others. This is, of course, a wide field, of which we can here only look lightly into the most important principles. They are, that others cannot injuriously change the quantity or velocity of the water, nor its quality.

1. Others cannot change the quantity or velocity injuriously. Before the code, while others could take any surplus, they were bound to leave enough to fill the prior appropriator's ditch (8 Cal. 327). Under the code they must leave the number of inches called for in the notice, or what is actually used, if less than that (ante). Whether the later comer is himself an appropriator or a riparian proprietor, makes no difference, for as has been seen, later grants of land are all subject to the prior appropriation; even a later railway grant from the Federal Government (101 U. S. 274). The way in which the diminution is caused is not important; for example, if sawdust from a sawmill clogs up one's ditch so as to diminish the flow, it is actionable (23 Cal. 481). Or if the velocity is diminished by a dam preventing the working of a placer claim, provided plaintiff is prior in time (46 Cal. 118).

It may be that our appropriator was himself later in time than others, and so, himself, had a right only to the surplus. In that case his surplus will be protected as fully as though it were the entire flow, and prior appropriators who exceed the limitations already shown under "exercise of the right" will be acting unlawfully, as there shown; likewise prior riparian owners who are taking more than is reasonably necessary for cultivating or pasturing their land or for the other uses that are allowed under the law of riparian rights (102 Cal. 151, 69 Cal. 255). Those riparian rights, it may be merely mentioned here, include irrigation, running machinery, watering cattle, for all of which a reasonable amount. They include also domestic and household use, for which there is no limit in amount the riparian owner can take, and for this purpose the riparian owner can take all, leaving none, whatever, to come down to the later appropriator (69 Cal. 255).

At this point the question of percolating water arises again. What if appropriated water is drawn off by percolation? This is of great importance to miners, because their works are likely to drain wells and springs and even streams in the neighborhood. As an eminent authority says:

"In sinking a shaft through permeable ground it is, of course, necessary to lift continuously the ground water. The water level thus acquires an inclination towards the shaft, which may thus receive not only the flow of the immediate vicinity, but even also that of neighboring river systems." Posepny on Ore Deposits (A. I. M. E.), page 19.

Up to the present this was regarded as what the law called "damnum absque injuria," a damage the law did not think proper to look into; and such is the law in most States, and in England to-day. But the recent California decisions, already touched upon, on their face appear to establish the new rule that the owner of wells, springs or streams may maintain an action for this. A tunnel draining a spring was held unlawful in 142 Cal. 437. A tunnel draining the supply from a surface stream, even before it ever reached the stream, is unlawful (141 Cal. 275). And one draining off water after it has reached the stream is all the more so (Montecito vs. Santa Barbara 18 Cal. Dec. 405). And likewise water cannot be taken from wells (141 Cal. 116). These cases will cover probably all that will usually arise, unless, perhaps, the following: That is the withdrawal of water by a mine may dry up the neighboring soil itself. In the Nineteenth Annual Report of the United States Geological Survey, Part II, page 274, in an elaborate investigation of the movements of ground water, it is said: "In another part of this paper it was shown, from direct observations, that the withdrawal of a comparatively small amount of water from a soil already saturated is sufficient to produce a marked change in the level of the ground water, and hence to cause marked changes in the level of waters in wells, and in the height of the ground water in sections where crops depend on water which is derived from the underflow by natural sub-irrigation." If an action can be maintained against a miner for draining a well by percolation, it is only a small step to holding him liable for draining the soil of the water needed for crops in "natural sub-irrigation." It is one of the many phases of the new doctrine that must be dealt with, and shows that, if logically pushed, the principle of Katz vs. Walkinshaw, 141 Cal. 116, may make the miner an insurer to agriculturists against damage to crops, etc., from desiccation; with this proviso, it will be admitted that the miner will not be responsible for the results in extraordinarily dry seasons, or, as it is called, from a "vis major," or "Act of God."

When one further decision is considered, it appears that the law of waters has taken a form that leaves the miner at a decided disadvantage in controversy with his agricultural neighbors. Not only is the miner liable if the water is taken from wells, etc., but, on the other hand, he must suffer the percolation of waste water from irrigation into his mines, and has no right of action even if it comes through in such quantities as to prevent the working of the mine. It was so held in Gibson vs. Pucbta, 33 Cal. 310. The result seems to be that the miner must not take water from the farmer's land, but the farmer is not reciprocally bound to keep the water out of the miner's works.

Mr. Justice Temple's opinion in Katz vs. Walkinshaw turns on the motive with which the water is drained, and would give no action if taken in the "ordinary use of one's land." But the court in its final opinion (141 Cal. 116 at 129 discussing the case in 69 Cal. 217) says that it will be no defense to the miner that he made or wanted no use of the water, or that his works were made in the legitimate and ordinary mining of his own land, and it must certainly follow if the rule, so often repeated, that the motive with which an act is done is immaterial, is to be sustained. The actual decisions, so far, also, on their face, seem to support this view.

That the miner's motive, through which the water is drained away by percolation, will not be looked into seems, then, to have with it the tendency of the decisions. But it is by no means positively settled yet—it is one of the many phases of the new doctrine of percolating water that the case of Katz vs. Walkinshaw has thrown open, and that await decision. The wide statement that the motive with which an act is done is immaterial need not be sustained. It is giving way in other branches of the law, especially where injunctions are granted against malicious combinations in strikes and boycotts. It is inconsistent with Mr. Justice Temple's opinion in Katz vs. Walkinshaw; and it is inconsistent even with the irrigation case cited above, where the decision went on the ground that the defendant's motive arose out of the undoubted right to cultivate and irrigate his land. If the motive is looked into on one side, it should also be on the other. If the motive to make profit by cultivating and planting in the ordinary way justifies the farmer in irrigating, the motive to profit by mining in the ordinary way should justify the drainage of water naturally incident to that. Any damage which then occurs would lie where the nature of the land as mineral or agricultural makes it fall.

The difficulty if the miner is held liable will be great in showing that the acts of the miner in fact do draw off the water, since there are no signs above ground, or in plain sight, such as there are when a surface stream is tapped by a ditch. When it comes to showing an underground connection causing the loss of percolating water from a well, it is likely that we shall have the same elaborate and indefinite discussions that have surrounded the suits to protect extralateral rights to a vein; to show an underground connection between the ore in one's shaft and the distant works of a trespasser, has always been a difficult undertaking. It may be remarked that the matter has not yet come before the Supreme Court of the United States; but there are a number of decisions in other States resembling the decision in Katz vs. Walkinshaw. They are collected in 64 L. R. A. 255 note.

2. The quality cannot be changed injuriously by later comers. As against prior appropriators or occupants, the general rule prevents any injurious change in the quality of the water. Thus, it is actionable if a later miner so muddies a stream that it cuts the hose of a hydraulic miner below, who was prior in time (27 Cal. 475). Sawdust cannot be thrown into a stream if it interferes with prior appropriators (23 Cal. 481). Injunctions were granted in the following cases for wrongfully depositing waste in streams, plaintiff being in some cases an appropriator, in others a riparian proprietor, for both are protected from such damage: 34 Cal. 231, where waste from sluice mining interfered with a prior agriculturist; 43 Cal. 39, where tailings clogged another miner's tail-race; 67 Cal. 267, where sediment filled a prior appropriator's ditch; 19 Cal. 623, where debris clogged a prior appropriator's ditch; 57 Cal. 412, where debris from coal mining was carried far down stream and there, when the stream overflowed, covered agricultural ground. The court there said that the long distance made no more difference than if the debris had been dumped on the fields after being carried there by carts or cars. And there are numerous cases dealing specially with debris from hydraulic mining, because the sediment interfered with others. In 19 Cal. 623, 66 Cal. 138, 66 Cal. 161, 18 Fed. 753, 81 Fed. 243, 88 Fed. 664—in all these cases, and others, hydraulic mining was enjoined.

As a result of these cases, Congress has prohibited hydraulic mining, making it a misdemeanor, unless under permission from the "Debris Commission" (27 Stat. at Large 507). This prohibition is made to extend to whatever the words "hydraulic mining" or "mining by the hydraulic process" meant in California in 1893, when the act was passed. Whether it would include such things as working over tailings, or dumps, or artificial banks of earth, by water under pressure, is not clear. If one puts emphasis on the words "hydraulic process," as Judge Lindley does, then such work would be included (Lindley on Mines, 2nd Ed., Section 552, et. sq.). On the other hand, if emphasis is put on "mining," it might seem the other way; the washing of tailings is rather analogous to smelting or ore dressing, only incidentally following mining or extraction of ore. There seems an argument in saying that the act meant to hit at the principal, and not the incident when separated from it—at a kind of mining and not at a kind of process. In that case the treatment of material already mined is not, primarily, mining. Though following mining as an incident where the extraction and treatment are continuous, it is not strictly mining when the two are separated. It might not be within the act in this view, but would be left as at common law. The question seems one of emphasis in the use of the words, "mining by the hydraulic process," or "hydraulic mining."

The right to deposit waste in streams may, however, exist. It may arise by priority of right on public lands (7 Cal. 148), though priority will not sanction it if it amounts to a public nuisance (66 Cal. 138). The most important consideration, however, is that no one can complain of pollution of a stream if his own use, though prior, is not materially interfered with. The burden is on the plaintiff to show an injury, and so, for example, a placer miner can have no action where later comers above muddy the stream but still leave it fit for his purpose. (Atchinson vs. Peterson, 87 U. S. 507. Also 8 Cal. 327, 11 Cal. 143, 25 Cal. 481.)

The question of pollution of streams is one of great importance. The subject is treated at large in the recent bulletin of the United States Geological Survey, Number 103, Water Supply Series, and in Lindley on Mines, second edition, section 838 et sq.

3. Form of remedy. The owner of the water right has the usual recourse to the courts, as he has in the protection of any other property. The most efficient remedy is, of course, the writ of injunction, whereby interference is stopped forthwith. Among other requisites to obtain this, there must be a threat, or likelihood, of irreparable damage. An injury of a ditch which will not destroy its efficiency, and can be easily repaired, will not be enjoined—the owner will be left to his less drastic remedies. (35 Cal. 534). And another essential is, that the interference is, or is threatened to be, a continuing one in the future. An injury to a ditch already accomplished in the past is not a case for an injunction. (8 Cal. 392). A proper case was such as 23 Cal. 452, where some miners were engaged in works that were destroying a farmer's reservoir and ditch, and there still remained time to stop them. An injunction was granted. And in McCarthy vs. Gaston, etc., Mng. Co., 28 Cal., Dec. 377, a very recent case, an injunction was granted against pollution. In 17 Cal. 102 and 35 Cal. 534 an injunction was refused because of the rule known as the "balance of inconvenience," that is, because the injury to the plaintiff was small as compared to the injury to the defendant if his works were enjoined. Such a disproportion of inconvenience as to cause refusal of an injunction should not, however, depend on mere difference of money damage; the difference must go to the irreparable loss of some substantial right on the part of the defendant aside from money value, while the interference with the ditch, etc., causes but slightly such a loss to the plaintiff, leaving him substantially compensated if the defendant pays money.

Though every case of injury to a water right does not make a case for an injunction, it does make a case for damages; that is, money compensation. An interference with a water right is in the nature of a nuisance. (8 Cal. 77).

Other forms of action have been used. Very many suits have been allowed to quiet title to water rights, as to other property. (e. g. 130 Cal. 290). In Katz vs. Walkinshaw, 141 Cal. 116, it was said, in passing, somewhat in this line, that a suit will lie by a landowner to have his right to percolating water declared, though he has sunk no well or otherwise made use of it; but that will probably be a matter for further consideration if the case actually arises. If there are several claimants on one stream, the court will apportion it among the claimants, and adjust their rights thereto. (Miller vs. Dondero, 26 Cal., Dec. 211).

The remedy nearest at hand is, usually, a show of force on the part of the owner; and in a few cases this is quite proper. Reasonable physical force may be used always to keep off trespassers. In 75 Cal. 601, the court says this extends to a "molliter manus imposit," which, translated from the Latin, means "a gentle use of one's fists." Of course the law does not sanction serious bodily injury in putting a man off one's land.

4. Crimes: Under the penal code, there are the following crimes peculiar to this subject: Under Section 347, poisoning water in any spring, well or reservoir is a State's prison offense, and under Section 374 fouling the water by putting offal or filth into any



stream, pond, lake or reservoir is a misdemeanor. Under Section 499, stealing water from flumes, pipes, etc., is a misdemeanor. Under Sections 592 and 607, destroying or injuring flumes, reservoirs, etc., is a misdemeanor.

### The Cost of Diamond Drilling.

The subject of diamond drilling for prospecting purposes is known to miners almost everywhere, and yet there is much less of it done than its advantages seem to warrant. By systematic placing of the holes diamond drilling will give reliable information as to what lies in the rocks hundreds of feet distant in any direction that exploration is attempted. One reason, perhaps, that diamond drilling is not more generally employed is due to the unfamiliarity of miners generally with the equipment and operation of diamond drilling machines. These drills are of various sizes and shapes. Some are small, of light weight and readily portable from place to place in a mine, but are capable of drilling a  $1\frac{1}{2}$ -inch hole a distance of several hundred feet. Others are of large size, heavy, and can bore a hole several inches in diameter to the depth of a mile or more. Between these are many sizes and types of machines made by various manufacturers and suited to the differing conditions. The diamond drill can be employed on the surface for prospecting for ore, coal, stone or oil. It may be started in a river or on the beach, through water, or it may be taken into a mine, to bore from the bottom of a shaft downward or in any direction. It may be set up in a drift or stope and holes bored into the surrounding rocks in any desired direction. As a searcher for ore bodies it can be employed to great advantage, as the manager of the mine can inform himself at minimum expense of what lies on all sides of him.

In order to make prospecting of this sort valuable, the drill holes must be arranged systematically and a careful record of all work done made daily, and this should be carefully plotted on a mine map, in order to show the relative position of any valuable deposit cut to the existing workings of the mine. The diamond drill hole does not always maintain an absolutely straight alignment, it is true, but this is not important except in holes of great length. A hole will drift from a few inches to over 100 feet in 1000 feet. The cause of this in holes started vertically is difficult to understand, for in some instances the drill has drifted against a dipping formation, when naturally it would be expected to be deflected by it and the drill drift in the direction of the dip. In holes departing from the vertical, the tendency is for the hole to drift upward. A hole started absolutely level will in a few feet begin to point upward slightly, and this tendency increases with distance from the machine. This is due almost entirely to the fact that the drill bit containing the diamonds is a little larger than the pipe following it, which naturally bends slightly, causing the bit to be deflected upward. Though this at first be ever so little, in a hole 100 feet long the drift becomes very perceptible, and at 500 feet it is likely to reach 50 or 60 feet—that is, the bit at 500 feet from the machine will be 60 feet higher than where it started, though the hole was at the beginning perfectly level.

By a systematic arrangement of holes, the driller can usually correct for this deflection of the drill bit, so that its real position may be approximately known.

Another reason why diamond drilling is less popular than it is, is no doubt due to the impression that the cost of operation is excessive. That this is true is not the case, when the cost is compared with the expense of getting the same information by means of the ordinary drifts, crosscuts, winzes, raises and other mine openings.

In a Pennsylvania coal mine 4500 feet were bored at the rate of 19 feet per ten-hour shift at an average cost of \$1.37 per foot, the cheapest being a 500-foot hole at \$0.98 per foot.

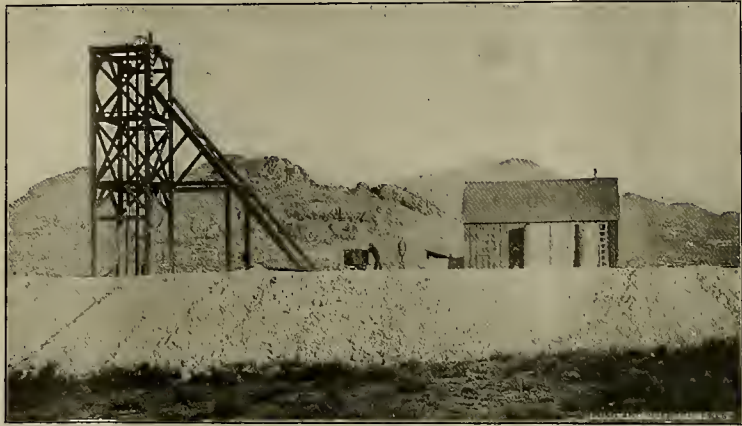
In very hard ground the cost ranges from \$2.50 to \$3 per foot for holes of considerable depth. In Canada over 2600 feet were drilled at a cost of \$0.98 per foot.

At the Wildman gold mine, at Sutter Creek, Cal., John Ross Jr., the superintendent, reports that, in 1895, the cost of drilling per foot was as follows: Labor, \$0.561; carbons, \$0.396; other supplies, \$0.047; total, \$1.004. In 1899 the cost was as follows: Labor, \$0.322; carbons, \$0.091; other supplies, \$0.005; total, \$0.418. This was the lowest cost at which drilling was done at this mine, and, taking the total of 4255 feet drilling, the average cost was as follows: Labor, \$0.416; carbons, \$0.218; other supplies, \$0.039; depreciation of drill, \$0.021; total, \$0.694. In the adjoining mine 4136 feet of drilling was done during a period of three years. The average cost was: Labor, \$0.42; carbons, \$0.16; other supplies, \$0.04; depreciation of drill, \$0.053; total, \$0.673. This covers all the cost except for the power for the drill, and on the average a diamond drill of the size used does not require more power than an ordinary piston machine drill (about 10 H. P.)

This drill bored a hole  $1\frac{1}{2}$  inch in diameter and yielded a core  $\frac{1}{8}$  inch in diameter, and was capable of drilling a hole 600 feet deep. In diamond drilling the deeper the hole the greater the cost per foot.

### The Discovery and Development of Tonopah.\*

Prior to the discovery of the rich gold-silver ores of Tonopah, Nevada had, for some years, attracted little more than passing attention from the outside world. That fortunate discovery, however, soon awakened renewed interest in the possibilities of the practically unexplored region south of Belmont. Scores of prospectors, mining men, geologists and others had passed that way before, but the unpromising outcrops on the slopes of the volcanic hills which rise above the desert, where now stands the town of Tonopah, did not prove attractive to them, if they were observed at all.



California Co.'s Works, Tonopah, Nev.

This proves how unwise it is for prospectors to attempt to discriminate between what they consider good formation and what they believe to be poor, though this belief may be based upon actual experience gained elsewhere. It is said that J. L. Butler, the discoverer of Tonopah, gave some of the croppings to an assayer for test, and that this assayer, whose experience should have taught him better,

lites, various porphyries, basalt and glassy volcanics. There are also metamorphic rocks and abundance of limestone. That any of these rocks, except perhaps the basalts and glassy vitrophyres, are destitute of valuable mineral deposits would be an extremely unsafe premise for the prospector, for in the numerous mining districts of that elevated region valuable ore deposits are found in almost every mountain and ridge. Some of the most valuable mines ever found in Nevada have been in sedimentary rocks—as the great lead-silver mines of Eureka district. The famous bonanzas of the Comstock at Virginia City occur in andesite, some of those of southern Nevada in granite and schist.

In the immediate vicinity of Tonopah the rocks are andesite of varying age. These rocks are both mas-

sive and fragmental (tuffs). Surrounding the Tonopah section are sedimentary rocks—quartzite, schists, limestone, etc. The rich gold-silver veins of the district are found in hornblende andesite, over which lies a later deposit of andesite in which no mineral veins have been found. A great portion of the later andesite has been eroded, leaving the underlying older formation with its veins exposed. Had



Two Thousand Tons of \$15 Ore, Too Low Grade to Ship, at the Omera Mine, Tonopah, Nev.

after keeping the ore a day or two threw it out, as too unpromising to spend fluxes, time and fuel upon to determine its value. The first assays were made at Belmont, Nev., and various pieces of the rusty looking quartz assayed from \$50 to \$600 per ton in gold and silver. Mr. Butler quickly returned to the scene of his discovery and located the claims he thought most valuable, and his judgment has since been abundantly proven to have been good.

Because a certain kind of rock has proven to be non-productive of valuable veins or ore deposits in one region or locality is not sufficient reason that good mines may not be developed in a similar formation elsewhere.

In the region of the Great Basin there is a great variety of volcanic rocks—andesites, trachytes, rhy-

erosion not thus uncovered these ore deposits there is no probability of their ever having been found.

As indicating that the volcanic andesites burst through older sedimentary rocks underlying the former may be mentioned the fact that the andesites are often found to include fragments of limestone and of granite, which have been included in the andesite as it broke through from below.

That the region has been one of repeated volcanic disturbances is abundantly proven by the succession of rocks uncovered by erosion, and faulting has also been an important factor in the formation of ore deposits and in their economic distribution.

The value of the ore in the outcropping veins having become known, the development of the district was rapid. The principal claim, the Mizpah, was divided into thirteen sections and each section leased to a party of practical miners, who in a few months

\*See illustrations front page.



made many thousands of dollars by shipping the ores to distant reduction works, hauling the ore 60 miles across the desert to Sodaville, a station on the Carson & Colorado Railroad.

The sequence of the most important geologic events in Tonopah district are given by J. E. Spurr as follows:

SEQUENCE OF FORMATIONS AND EVENTS IN THE VICINITY OF TONOPAH.

- Early andesite.
- Fracturing.
- Vein formation. (Primary minerals, quartz, valenianite, stephanite, pyrite, chalcopryite?) Values good: gold and silver, silver predominant.
- Erosion.
- Later andesite.
- Probable erosion.
- Dacite.
- Dacite breccia.
- Rhyolite breccias, flows, and dikes, intermingled with slightly stratified or interstratified pumiceous or tuffaceous fragmental material.
- Vein formation. (Primary minerals, quartz, pyrite). Values relatively low; gold and silver, gold apt to predominate.
- Erosion.
- Tuffs, with an occasional thin rhyolite flow.
- Elevation of tuffs.
- Tilting.
- Basalt.
- Chief faulting. (Affects everything preceding).
- Rhyolite (white) intrusion (probably Ararat, Oddio, Rnshton hills).
- Vein formation. (Primary minerals, quartz, chalcodony, calcite, siderite, pyrite). Values low; gold and silver, gold apt to predominate.
- Erosion.
- Dacite intrusion (Butler, Brougher, Golden, Siebert mountains).
- Mineralization (chalcodony, manganese). Values slight to insignificant. Mud veins.
- Erosion.
- Glassy rhyolite flow (slopes of Oddio and Brougher).

The camp in a few weeks after the first discovery had become a town. The houses were not conspicuous, the inhabitants being at that time mostly dwellers in tents, which is the usual form of shelter in new mining camps everywhere.

The top works of the several leases were scat-

ter, the walls of which are composed of thousands of glass bottles, forming a veritable crystal palace. It is needless to say that the contents of the bottles has long since disappeared in the dry atmosphere of that region. There are several structures of this character in camp. But there are also numerous well-built handsome homes and merchandising establishments, as also well appointed and substantially built mine buildings. Tonopah has settled down from the feverish prospecting period into a substantial, though less exciting condition of business enterprise. Those seeking new fields with hope of a sudden fortune are gone southward to Goldfield, Crater, Bullfrog and other new camps, and there they will do, and are doing over again, what has already been done at Tonopah.

A third illustration (see front page) is that of the Hasbrouck mine at Gold Mountain, 6 miles south of Tonopah. The surface equipment is a model of simplicity. The two-post head frame, with a single set of back braces, the guides, bucket and crosshead, all indicate that the plant has been designed by an experienced and economical miner.

### Comparative Costs of Producing Copper.\*

With copper rising in price, with a greater demand for the same during brisk trade in the near future than the visible supply is capable of, under these circumstances it is interesting to see how costs of production have been lessened, and the scope of low-grade ores widely increased so that they can deliver their copper contents to satisfy this growing need. While studying the balance sheets of the principal mines of the world, as Rio Tinto, Mount Lyell, Calumet & Hecla, and the many big concerns operating in the United States, Mexico and elsewhere, we can highly praise the enterprise of the Tennessee Copper Co. for minutely publishing their costs per ton of ore treated and per pound of copper produced, and wish that the others, including the British Columbian companies, would be as public spirited. The benefit of publishing costs in detail is of the greatest advantage to each and every mine, as it creates a

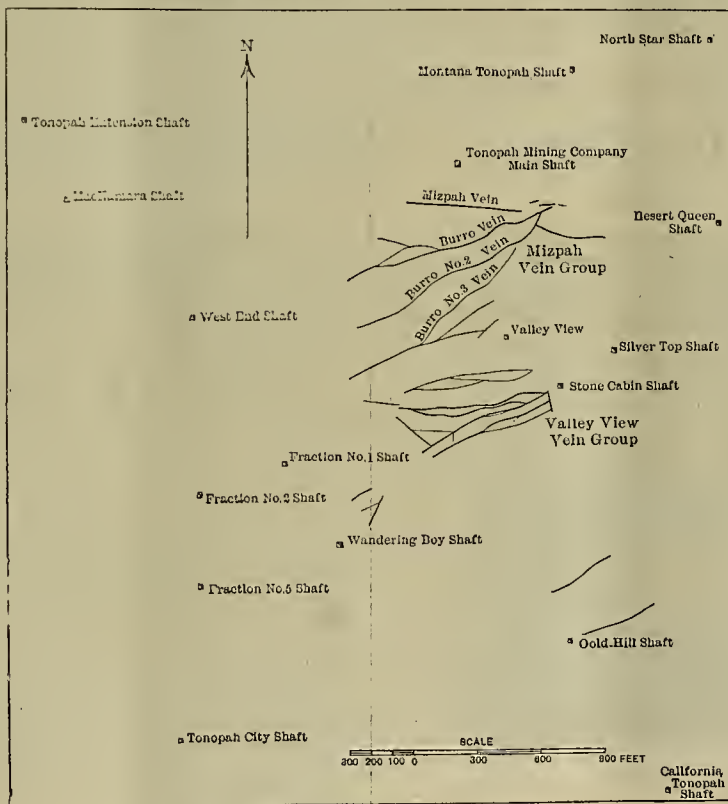
among other mines, have forty years ahead of ore blocked out for a daily consumption of 5000 tons. The grade of the ore is known, the costs of mining and treating are established, the profit is confirmed, and the possibility of cutting these costs still lower and making smaller slag losses, so increasing profits, is ever kept in sight. For their last fiscal year the Granby's output was 16,024,415 pounds of refined copper, with silver and gold to boot, from 516,059 short tons of their own ore treated, and over 40,000 short tons of custom ore and matte.

From a perusal of all the balance sheets published, it would appear that after the British Columbian record of \$1.35 per ton of ore treated in smelting and converting to blister copper, next comes the Tennessee Copper Co. with \$1.81 for the same results.

The Boundary ores dispense with all previous roasting, and use only lucrative value-bearing fluxes outside of coke, which account for the high duty of their furnaces, the first metal giving 50% copper, ready for converting to blister without a second previous fusion. These natural advantages are a great incentive to investment, and the hope of cheaper costs yet depends mostly on further railway competition and lower freight rates; extended communication with other large coal fields which are ready, waiting with keen avidity to market, at lower prices than now rule, their excellent fuel; and lastly, affording an even more extensive choice of lucrative fluxes to blend from the numberless copper fields known to exist. In fact, British Columbia is exerting herself to turn out immense tonnage of ore and coal, and to handle and treat that ore, by labor-saving devices, cheaper than is done elsewhere, taking advantage of the fluxing qualities in silica, lime, and metal to satisfy the chemical requisites for high duty and clean slags in the furnaces. Speaking of slag losses, all the companies are very diffident of publishing particulars; the general average is supposed to be three-tenths of 1% and more, equal to six pounds and over of copper per ton of slag. This, compared with the contents of the ore, seems wasteful, and the writer is still confident of his suggestion to use a reverberatory furnace as a forehearth to the blast furnace; then the slag will have space to allow the matte to more thoroughly settle, so bringing down the slag loss to one-tenth of 1% copper only; that it will also permit the use of the waste heat of the slags, in combination with the heat from the grate, to superheat the blast before entering the tuyeres to 1800° F., and reduce the consumption of coke from 12% to 5% and less.

The system of mining in the Boundary is open to criticism, not on account of its cheapness, for that is excellent, but on account of the factor of safety to the miners employed. In the open cast "glory holes" the machine drills operate to the supposed best advantage to blast down the ore. Sometimes a bluff is left, sometimes a slope covered with moving broken ore. Both situations are dangerous to the operators in setting up the drills, and it is questionable if it is not as cheap to mine in steps of about 20 feet deep vertically, and wide enough horizontally to allow steam or electric machine shovels to work in removing the broken ore. Explosives could be immensely economized, since all the holes, whether down or horizontal, will be the same length, and the quantity necessary to break without shattering would soon become known. Crushing by jaw breakers is cheaper than bulldozing with dynamite. According to local prices, the square-set system of timbering underground costs 35 cents per ton of ore extracted, a high item on low-grade ore. To avoid this cost, up-raises are put in on an average 25 feet apart, reaching from level to level 100 feet from one another, or to the intermediate levels half that distance. When these raises are ready a sufficient thickness of floor to hold up the track in the higher level is left—say, one set deep, then the ore is taken out from raise to raise from top down without timbering, and as wide across the deposit as the ore will come on a slope. The ore delivers itself into the chutes and is drawn off at all times as required, and to clear the slope; but as the slope goes farther and farther down from the roof, it is impossible for the miners to watch the roof for safety.

After blasting they start again drilling before all the smoke is clear, and before objects a short distance away are visible, for heavy loading in shooting is the rule, and so they take chances of a small piece or tons of the roof shaken by the last blast dropping on them. It cannot be long before a higher value will put locally on a man's life, and the present Government inspectors become competent and do their duty. This account is given to bring out suggestions for cheap mining combined with safety to the workers, either by individual protection in some iron-clad sentry box removed with the drill before blasting, or some other protection by timbering near the roof. Miners have already been granted by law an eight hours' shift. The smelter hands are jogging the local members of the Provincial Parliament for the same, and will probably get it. This, however, will only slightly affect the cost of smelting, since labor-saving feeders are being introduced and found to work well. This is a car holding two tons and side dumping; it travels singly as an electric tram, picks up from the chutes of the blast its weighed proportions of coke, flux, and ore, and dumps the whole mixture into the furnace; when humouring of a



Map Showing Vein System at Tonopah, Nev.

tered along the strike of the principal vein, and a somewhat primitive method of mining and of handling the ore was practiced. These scenes were being enacted during 1901-02, and have to a great extent ceased. The principal claims have been consolidated into corporate holdings and the mines are for most part well equipped and are being systematically developed. The headframe of the California company here illustrated is in striking contrast with the simple tripods of the early days in camp. There are also steel headframes of modern design on some of the mines, and Tonopah has emerged from a prospectors' camp into one of the prosperous up-to-date mining towns of Nevada, with a promising outlook for the future. The metallurgical question is still the all important one, as the ores do not yield their values readily to any process as yet tried upon them, but this is a detail which will probably soon be satisfactorily solved.

There are in Tonopah some oddities in architecture, one of which is illustrated on the front page. It is a res-

healthy rivalry and a beneficial pruning of extravagance. Bewick & Moreing have shown the good results of publishing costs in gold mining; why not others also in copper mining?

Secrecy and an unfamiliarity with methods in vogue make the public look askance at smelting concerns, as, if one manager fails them, they do not know the rudiments to be certain where the fault lies. This especially applies to British capital invested in Rossland and some parts of British Columbia. The public have to take or leave a prospectus, believing it implicitly or becoming canny, for they are unable to verify costs of smelting or have the details at hand as in gold mining.

This is a pity; for when you have immense deposits where you have established the average contents per ton, and have a long life ahead blocked out, what more legitimate investment can be asked for? For example, the Granby company in Boundary district,

\*R. C. Cambell-Johnston in London Mining Journal.



bad spot is necessary the antidote is carefully placed when loading, and then applied to the sore in dumping, so dispensing with all shovellers and trammers on the feed floor. The slags below are removed in five-ton slag cars moved by a narrow-gauge engine. The matte is tapped into a tilting kettle holding as much as ten tons of matte, constituting one charge, traveling from an electric crane to the converters, so that little labor is used in a smelting works.

If the public will become familiar with the essential details of cheap mining, cheap transportation, cheap smelting, judicious blending of fluxes, and sufficient capital to take the full profit of refining at the works, with the local manufacture of the product into wire, etc., if necessary, then copper shares are a most enticing form of investment at the present time, with long-lasting qualifications.

## Notes on Crushing of Metalliferous Ores in the Stamp Battery in Africa.

NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by  
F. C. ROBERTS.

The rock breakers in general use in Africa are the Gates and Comet gyratory and the Blake and Dodge oscillating, although these are by no means the only crushers on the market. The suspended Challenge automatic feeder is universally used.

The mortar boxes employed vary slightly in outside dimensions, according to the dimensions of the heads and shoes used, but the inside clearances remain practically the same.

The popular type of mortar is the F. O. C. No. 110 pattern, the interior dimensions and design of which are calculated to more readily assist in the discharge of the product than is the case with the older types.

The mortars are all furnished with false bottoms for compensating in the wear of the dies. Liners are also supplied, which are bolted to the ends and back of the mortar, thus protecting these areas from wear.

With but few exceptions, the "heavy" wire-cloth screen is used, the range in mesh being from 400 (20-mesh) to 800 (about 28-mesh).

The automatism of the feeders is obtained by the tappet of the central stem coming in violent contact with the feed rod, of which two types are used, viz., the "straight rod" and the "goose-neck." Hardwood guides are almost exclusively used.

The stems are of steel and vary slightly in dimensions. Those used in the latest mills are 3½ inches in diameter and 16 feet in length, tapered at both ends to allow of reversing.

The cost per ton of ore milled in Rhodesia for stems is .1044 cent.

Cast steel tappets and heads are used, the former varying only in bore, while larger variation is shown only in the dimensions of the latter.

From an extended series of experiments carried out, it has been found—at least, with Rhodesian ores—that the manganese steel shoes and dies give the most economical results. The cost of these spare parts in Bulawayo is \$9.70 per 100 pounds weight, or .096 cent per pound.

The life of a manganese steel shoe having the following dimensions, 9 inches diameter by 12 inches deep, when crushing ordinary hard quartz, has been found to be ninety days, i. e., when reduced to a thickness of 2 inches. No realization on scrap iron or steel is possible in Rhodesia. The consumption of steel per ton of ore crushed was .52 pound and the cost per ton .0554 cent.

The dies of the same material, 9 inches diameter by 7 inches deep, used under the same conditions, lasted for the same period, the consumption of steel per ton of ore crushed being .27 pound and the cost per ton .027 cent, or slightly less than one-half the cost of shoes.

Cast steel cams of the Blanton type are used, the breakages representing a cost per ton of ore milled of .01 cent. Should the web of the cam be slightly increased in thickness, breakages would seldom, if ever, occur in a well-regulated mill.

The cam shafts employed are of forged steel, 6½ inches in diameter by 7 feet long. The breakages are due to crystallization and represent a cost of .0316 cent per ton of ore milled.

The earlier mills erected in Africa were of the lighter type—stamps varying from 700 to 900 pounds in weight when new. The tendency for the past eight years has been towards a gradual increase in weight, until now there is more than one mill installing stamps weighing 1445 pounds. Up to quite recently the popular weight was 1258 pounds, made up as follows:

Stem.....	Pounds.....	604
Head.....	284	
Shoe.....	285	
Tappet.....	135	
Total.....	1,288	
Die.....	134	

The weight of the heavier stamps is made up as follows:

Stem.....	Pounds.....	604
Head.....	437	
Shoe.....	299	
Tappet.....	135	
Total.....	1,445	

It is a question open to much discussion whether the practice of employing such heavy stamps is fully compensated for in increased capacity. It is, of course, almost impossible to obtain accurate comparisons in the capacity of two mills—one, say, of 1250 pounds and the other of 1465 pounds—that is, where all of the factors are identical; but it appears to the writer that the economic limits have been reached in the weight of stamps, if this point has not already been passed, and certainly the recorded duties of the heavier mills—in instances where, as far as one can judge, the working conditions are equal—show little or no improvement over the 1250-pound stamp.

It would appear that there is considerably more scope for improvements in other directions for increasing the crushing capacity of the stamp mill.

The theoretical consumption of power required to operate the stamp varies with the weight of stamp, the height of drop and the number of drops per minute.

The popular method of operating the mill in Africa is as follows:

Order of drop, 1, 3, 5, 2, 4.

Number of drops per minute, 96.

Height of drop, 8 inches.

Thus with the 1250-pound stamps the power required would be as follows:

$$\frac{1250 \times .66 \times 96}{33,000} = 2.4 \text{ H. P.}$$

$$\text{Add } 33\frac{1}{3}\% = 3.2 \text{ H. P.}$$

While with 1465-pound stamps the power required would be as follows:

$$\frac{1465 \times .66 \times 96}{33,000} = 2.8 \text{ H. P.}$$

$$\text{Add } 33\frac{1}{3}\% = 3.7 \text{ H. P.}$$

The formula, by H. Louis, given below, is largely used:

S = number of stamps driven off one shaft.

M = weight of cam shaft cams and pulley in pounds.

d = diameter of cam shaft in inches.

W = weight of one stamp in pounds.

h = height of drops in inches.

n = number of drops per minute.

k = radius of cam hub in inches.

r = distance between centers of cam shaft and stamp stem in inches.

$$\frac{S n W h}{12} + \frac{(S n W h)}{360} + 0.08 \left\{ S n W \left( \frac{2 k h + h^2}{24 r} \right) \right\} + \left( M + \left( \frac{h S}{n r} \right) W \right) d n$$

$$\frac{180}{33,000}$$

The consumption of fuel (wood) on a well arranged plant in Rhodesia should not exceed .05 cord per horse power per twenty-four hours. The cost of fuel shows some variation, but \$7.20 per cord would be a fair average. Basing the calculation on a 5-ton per stamp duty, the consumption of fuel per ton of ore crushed amounts to .032 cord, while the consumption of fuel per stamp of 1250 pounds would be .16 cord. The cost per ton of ore crushed for fuel alone is \$0.2304.

The most common type of boiler used in Rhodesia is the multitubular externally-fired boiler. This design is particularly adapted to countries where an inferior bulky fuel is used. In rare instances the Babcox & Wilcox water tube boiler is used. On the Rand fields a very wide variety of boilers are used, the last-named boiler being a popular one. Where the requirements are small the loco type boiler is used; but beyond, say, 30 H. P., these boilers are both extravagant and unsatisfactory.

The metallurgical treatment of an ore may be said to begin with the first sizing of the product as it is delivered from the mine. As the process of cyanidation or chloridization will not be dealt with, a resume of that common to that stage only will be given.

The sequence of treatment may be summarized as follows:

1. Sizing.
2. Sorting.
3. Crushing.
4. Milling.
5. Amalgamation.
6. Concentration.
7. Classification (sands).
8. Classification (slime).
9. Cyanidation (sand).
10. Cyanidation (slime).

We will premise a plant with a separate crusher station.

The ore as it is hoisted or trammed from the mine is automatically dumped over grizzlies set at an angle of about 50° to the horizontal. The usual spacing of the bars is 2 inches, the outside dimensions of the grizzly being 7x5 feet. Where large rock-breaker capacity is provided, it is advantageous to set the bars with spacings 1 foot wide, so that a finer product is conveyed to the bins.

The under-size product (fines) is conveyed direct to the mill bins by means of trucks, skips or belt conveyors. The over-size (coarse) is sometimes subjected to very coarse crushing—which process is not desirable when handling any appreciable quantity of waste rock—or is at once passed on for sorting.

The sorting arrangements embrace the revolving table, traveling belt or ordinary flat sheets. The importance of rigidly enforcing this branch of the work is recognized on the Rand fields, but in Rhodesia a large demand is made for everything coming from the mine, with the result that many tons of barren rock are milled.

Probably the most economical, if not the most effective, method of sorting is accomplished with the revolving table, which allows of an economical distribution of labor, very little wear and tear and a small consumption of power. The traveling belt has come into favor during the past few years, and certainly when it is desired to elevate, within certain limits, or to convey the product, this latter device is preferable to any other. In some cases on the Rand fields, where a large proportion of the narrower reefs are being mined, as much as 42% of the delivered product is discarded.

The importance of producing a product as nearly uniform in size as is consistent with economy can not be too strongly emphasized, and, with this object in view, double crushing is largely practiced. From the sorting table or other arrangement the ore is conducted to No. 1 crusher, where it is reduced to about a 2½ inch ring. It is then dropped over grizzlies, the under-size being delivered to the fines bin, while the over-size is conveyed to No. 2 crusher, where it is reduced to about a 1-inch ring, delivering direct into the fines bin.

This preliminary crushing might be extended economically by the introduction of a third crusher and possibly an intermediate grizzly, since the stamp mill seems only within certain limits to be the more economical method of reducing the product to its final state. With the entry of the ore to the mill bins begin the considerations directly effecting the extraction of the gold values.

(TO BE CONTINUED.)

## THE PROSPECTOR.

The mineral specimen from Tulare county, Cal., is volcanic ash and consists of microscopic fragments of feldspar, with occasional small scales of muscovite mica. It is not Fuller's earth.

The green specimen from Manvel, Cal., is chrysocolla (copper silicate), not turquoise. The black rock is augite andesite and the bright mineral flakes in the quartz rock are specular iron. No galena or other form of lead present.

The mineral specimens from Prescott, A. T., are: No. 1. Metamorphic clay slate impregnated with pyrite. No. 2. An altered granite probably from near the slate. No. 3 is an ore in which are visible iron, copper, lead and zinc sulphide. It probably contains gold and silver as well. The yellowish-green stain on No. 4 is due to the decomposition of an arsenical ore, probably mispickel.

The rock specimen from Weaverville, Cal., is metamorphic sandstone containing grains of cinnabar. A large body of this ore would pay to work for the quicksilver.

The mineral samples from Rossland, B. C., have been determined as follows: No. 1. (White.) Is granular quartz with marcasite and a little zinc blende. No. 2. A metamorphic rock in which is disseminated a considerable percentage of pyrrhotite (magnetic iron sulphide). It also contains a large amount of magnetite in finely disseminated grains.

The rock samples from Homestead, Or., are determined as follows: No. 1. A finely-granular quartz rock, stained with iron oxide. No. 2. Pyrolusite (manganese oxide) with wad (an impure ore of manganese and iron oxides). No. 3 is calcite.

The rock sample from near Marysville, Mont., is a crystalline granular limestone, the brown color being due to iron oxide.

The ore from Granite, Grant county, Oregon, is quartz in which is disseminated, in dust-like particles, iron sulphide. These are so numerous in places as to give the rock a bluish color. Galena (lead sulphide) is also seen, and there is present small particles of reddish iron-black mineral with a blood-red streak, which may be ruby silver (proustite), a combination of arsenic, sulphur and silver, or pyrrargyrite, a composition of antimony, sulphur and silver. The grains are so small and occur in the rock so sparingly as to be indeterminate.

The rock specimen from Lamar, Colo., is a dense, closely compacted sandstone. It is made up almost entirely of rounded quartz grains. The reddish-brown bands are due to iron oxide.

The light brown earthy material from Tacoma, Wash., is infusorial earth. It has absorbent properties and was formerly extensively used in the manufacture of nitro-powder, but is less used for that purpose now.



## Chlorine in Metallurgy.\*

Written by JAMES SWINBURNE.

The essence of metallurgy, as practiced for thousands of years, is the reduction of the oxide of the coveted metals with carbon, as such or as monoxide. Some metals, notably iron, exist in nature ready as oxide, but most of the others are found as sulphides. The sulphides are, therefore, roasted to convert them into oxides, and the oxides are reduced with carbon. Modern metallurgy broadly consists of the reduction of oxides to the metallic state.

The process I have the honor of bringing before you depends on the action of chlorine. Chlorine has been used in metallurgy before for attacking metallic gold; and salt has been employed for "chloridizing" roasting. The present process is, however, a new departure, of quite a different kind, and really a new form of metallurgy calculated to displace the oxidation and reduction processes now in use to a great extent. How far the replacement will take place depends eventually on economy only.

The principle of the process is treating sulphide ores, without previous roasting, with chlorine, so as to form chlorides of the metals, the sulphur being liberated as such. The chlorides are then electrolyzed, yielding metals and recovering the chlorine. The chlorine thus goes round and round, and the process in its simplest form is analogous to separating the sulphur from the metals electrically, and changing the ore, at the mere expense of electrical energy, into its component metals and sulphur. This can in fact be actually done. In one of my first patents there is a description of electrolyzing a bath of, for instance, zinc chloride and zinc sulphide, with carbon anodes and fused zinc cathode. This gives off zinc at the cathode and pure sulphur, not chlorine, at the anode. This simple method is not applicable to many ores on account of gangue, iron and other metals. It is mentioned to give a clear idea of the essence of the process.

In practice there are further modifications. The process naturally gives the best commercial returns on ores that are refractory to other treatment; and complex ores yield mixtures of chlorides and gangue which could not be electrolyzed straight off without intermediate treatment. The intermediate treatment is always simple chemically, and consists in removing the gangue and substituting zinc for the other metals, one after the other, till there is nothing but chloride of zinc left. The chloride of zinc is then electrolyzed and the zinc and chlorine recovered. If there was no zinc in the ore, all the zinc obtained is used up again; but if there was zinc in the ore it is sold as zinc.

The action of chlorine on sulphides is generally very vigorous and enough heat is generated to keep the mass hot. The transformer is something like a small cupola. It is an iron vessel lined with firebrick and it contains mixed chlorides fused carrying the gangue and ore. The ore is run in at the top continuously and chlorine is pumped in at the bottom; sulphur coming off and passing over into a condensing chamber. There is no difficulty about pumping chlorine. Iron cylinders, pistons and valves are employed, and, as is well known, though not fully realized, dry chlorine, such as that from the electrolysis of fused chlorides, is a very harmless gas.

The transformer is tapped at intervals, and the mixed chloride and gangue run into water. Broken Hill slimes, a waste product daily becoming more mountainous, have been chosen to work upon. They contain zinc, lead, iron, silver, manganese, sulphur and gangue. The gangue and lead chloride come together, and the lead chloride is separated, the silver extracted and the lead chloride electrolyzed. The soluble chlorides are treated with chlorine, to get ferrous into ferric chloride, and the iron precipitated with zinc oxide or calamine. The manganese is got out separately or with the iron in a similar way. The zinc chloride is then boiled down and electrolyzed. The electrolysis vat is simply an iron case lined with fire brick, and is kept hot by the excess of the electric over the chemical energy.

The history of the process is simple. The first patents were granted in 1897, and the process tried in the laboratory and everything worked well. It was then tried on a pound scale and worked. A plant was taken in Milton, and large scale experiments on electrolysis and handling of chlorine were carried out. A 3000-ampere electrolytic vat was run continuously for three months. Facilities were wanting there. A. J. Smith, the general manager of the Castner-Kellner Co., saw a chance of a future in the process, and the company made arrangements for us to put down an experimental plant next door to its works. This was done and the transforming was proved on a large scale.

We have repeatedly learned from the technical journals that the chlorine reaction does not take place, and that fused zinc chloride cannot be electrolyzed. In fact people have proved it with test tubes. The Castner-Kellner Co., however, was able to investigate the working of the process, and to inspect the transformer consuming at the rate of thirty tons a week. It was well enough satisfied with the results

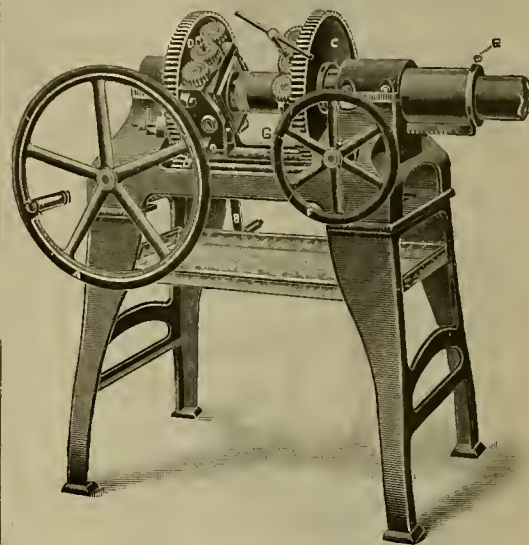
to arrange to take the works over, acquiring a license to make chloride of zinc. It thus uses the whole process except the electrolysis, as they have a supply of chlorine from the soda works. It will run a 10,000-ampere vat for demonstration, but otherwise will sell every metal but zinc, the zinc being sold as chloride. The only difference in the process is that zinc chloride must be much more highly refined for the market than for electrolysis, as a trace of manganese, for example, would spoil the color, but would do no harm in electrolysis. The chlorine is also damp, and has to be dried before being pumped.

A good deal of work has been done recently on the treatment of ores with little metal content, such as copper ores running under 3%, and copper, nickel and cobalt ores. These modifications have only been tried on the small scale, and so it is too soon to speak yet, but apparently low-grade copper, nickel, cobalt, and, of course, their mixtures, and copper-zinc ores of low content, will prove amenable.

## The Confidence Mine, Tuolumne Co., Cal.

One of the noted mines of the East Lode of California is the Confidence, situated about 12 miles east of Sonora, in Tuolumne county. This mine was discovered thirty-five or more years ago by prospectors coming into California over the Sierra Nevada from Nevada. The croppings were observed in the coarse reddish granite a short distance from the trail, and several claims were located on the series of veins which comprise the outcrop. It is at an elevation of 4000 feet, not far from the metamorphic slates and schists of the Calaveras formation. The vein system strikes north 14° west, dipping easterly at 18° to 30°. In the early history of the mine the rock was rich and the output large, said to have exceeded \$5,000,000. In size the vein varies from a few inches to 15 feet or more. In some portions of the property it splits up into several veins of variable size. The granite in which this vein system occurs is coarse and stained red with iron oxide, beside which the orthoclase feldspar has a red or pink color. This granite is decomposed to a depth of about 300 feet in the vicinity of the vein. Below 300 feet the granite is firm and hard, and approaches more nearly in appearance and composition to the normal grano-diorite of the Sierra Nevada. Usually a felsitic dike rock of light greenish color, due to dissemination of chlorite, is an accompaniment of the vein. Although developed below 1000 feet, the mine makes comparatively little water—about sixty gallons per minute. The mine has been extensively operated and is well

cutting and threading pipe from ½ inch to 4 inches in diameter. The pipe is inserted in the barrel at E, bushings being furnished so that long lengths of pipe may be kept well centered in the barrel. These bushings are set in the end of the barrel and held fast by a thumb screw. The pipe is clamped in place between serrated vise jaws by means of a key at the



Pipe Threading Machine.

sliding head C, and the same key, at D, is used for locking or unlocking the threading die. A rack and pinion, operated by the wheel F, moves the sliding head C back and forth, the operator moving the wheel F to the right in order to feed the pipe into the die head. The cut shows the hand-power type of machine, in which the large drive wheel A is used to revolve the heads. This shaft moves in a sleeve, and by pushing it inward toward the machine it engages the beveled gears at the back and revolves the relatively high-speed head at C. By pulling it outward it engages the beveled gears in the front of the machine and moves the slower motion die head D. In a central position, it moves both heads in opposite directions. Where small pipe is being threaded, the drive wheel is thrown into its central position and the two heads move in opposite directions, giving the maximum speed. For intermediate pipe, the driving shaft is locked in the position closest to the machine, driving only head C and leaving the cutting head



Confidence Mine, Tuolumne County, Cal.

equipped with mining and milling plant. The metallurgical experiments made at this mine in the way of concentration and cyanide treatment forms an interesting chapter in the history of the mine.

The ore is quartz and is generally considered free milling, but the sulphides are high grade and difficult to save because of their tendency to slime. To save these slimes canvas plants have been successfully employed. The slimes resulting from the ultimate classification and concentration of the tailings often run upwards of \$1000 gold per ton.

It is stated by the superintendent, N. Carmichael, that the total recovery of values is about 90% of the assay value. Of this 50% is by amalgamation, 16% by the various methods of concentration and 34% by cyanidation.

## Pipe Threading Machine.

Herewith is illustrated a pipe-threading and cutting machine, built by the American Pipe Threading Machine Co., 200 S. Clinton street, Chicago, Ill., which has three changes of speed and has a range of

stationary. Where very large pipe is being threaded, the shaft is locked in a position where only the cutting head at D revolves, the pipe remaining stationary in the clamp head C. The rack and pinion actuated by wheel F gives the head a travel of about 8 inches, being sufficient to feed the pipe to the die for a continuous thread of that length; but provision is made for threads longer than 8 inches by releasing the vise jaws and back head C as far as possible, tightening the jaws and operating as at first, making another cut of 8 inches. This can be continued indefinitely. The hand crank wheel at A may be taken off and replaced with a pulley where belt power is desired.

The length of the day, that is, one complete revolution of the earth on its axis, is 23 hours, 56 minutes and 4.09 seconds. This interval of time may be measured with absolute accuracy by the passage of a fixed star past the range of two fixed objects. Engineers who have no other means at hand have sometimes taken advantage of this knowledge to regulate watches and chronometers.

\*Trans. Int. Elec. Congress.

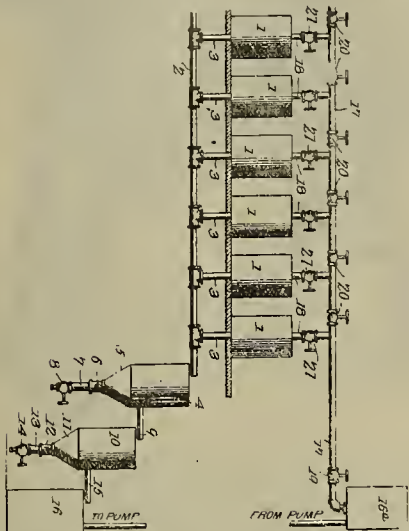


## Mining and Metallurgical Patents.

PATENTS ISSUED DECEMBER 27, 1904.

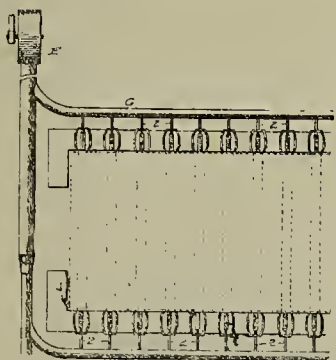
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METHOD OF RECOVERING PRECIOUS METALS FROM SOLUTIONS.—No. 778,348; I. Anderson, Prescott, Ariz.



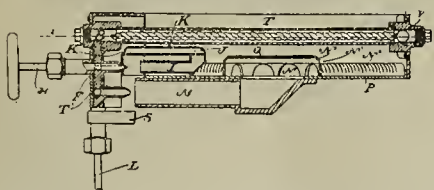
Process of recovering precious metals from cyanide solution and regenerating cyanide solution by introducing into cyanide solution radicals with which precious metals will form compounds insoluble in solution of potassium cyanide, then adding sulphuric acid to solution to precipitate insoluble compounds of precious metals, separating solution from precipitate and regenerating cyanide solution by precipitating sulphuric acid present by means of addition of lime.

BRICK KILN.—No. 778,441; J. C. Boss, Elkhart, Ind.



In combination, in kiln, arch, air box at bottom of arch, box being formed of brick, fire bricks resting on air box and slightly separated from each other to provide elongated openings extending transversely of arch, and mortar arranged at ends of elongated openings and between fire bricks, mortar sloping outwardly from lower part of fire brick to top to provide flaring discharge mouths.

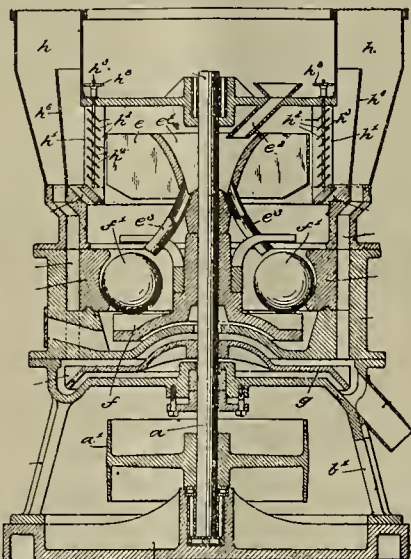
HYDROCARBON BURNER.—No. 778,443; C. F. Capell, Los Angeles, Cal.



Hydrocarbon burner having frame, vaporizing chamber composed of three vaporizing tubes alternately connected together at opposite ends in frame and having ends projecting through frame; liquid fuel inlet at one end of tubes and vapor outlet at other end of tubes; non-inflammable cords in tubes; removable plugs in ends of tubes; vapor tube having channel having two outlets connected with vaporizing chamber, last vapor tube being surrounded on three sides and at top by frame; removable plate in frame surrounding ends of tubes comprising vaporizing chamber; small mixing chamber under ends of tubes adjacent to vapor outlet and provided with slots in top thereof and one in edge thereof adjacent to vapor tube; larger mixing chamber under tubes having central space with radiating channels extending therefrom, radiating channels and top being

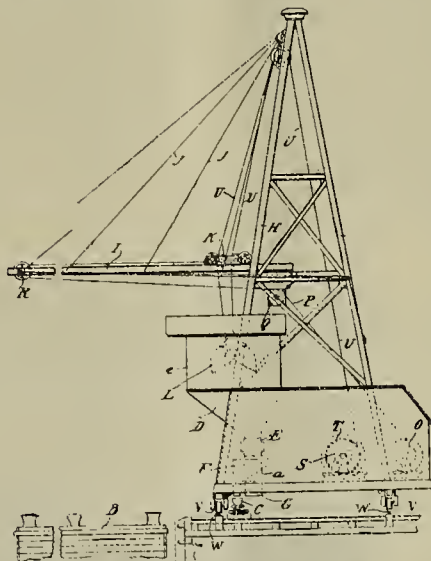
slotted; air tubes connected to mixing chamber to receive discharge of vapor from vapor outlets.

AIR SEPARATOR FOR CEMENT GRINDING MILLS.—No. 778,452; H. Hitzel, Alpha, N. J.



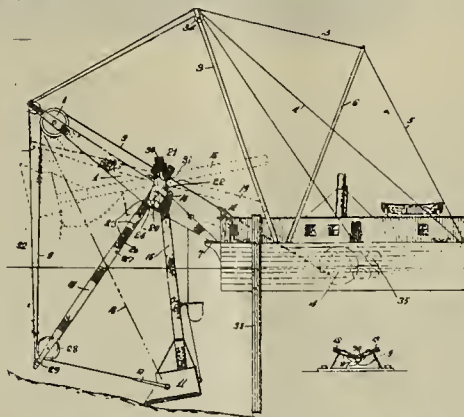
In cement grinding mill, settling chamber arranged at top of mill and outside of mill proper, air exhaust apparatus located within mill above grinding path arranged to discharge cement-laden air into settling chamber, air inlet located below exhaust apparatus and above grinding path, partition within settling chamber against which air from inlets is discharged by exhaust apparatus, and cover of fine netting for top of settling chamber.

HOISTING APPARATUS.—No. 778,502; L. Moss, New York.



Combination with hoisting apparatus comprising hoisting bucket and means for operating same, receiving and discharge hoppers, and auxiliary carrier extending between hoppers, of removing conveyor independent of hoisting apparatus and arranged to receive material from discharge hopper.

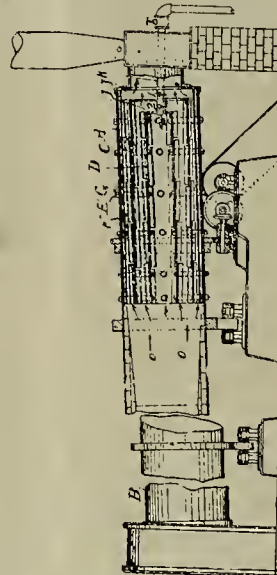
DREDGER.—No. 778,634; William A. Collins, Bloomfield, N. J.



In dredger combination with boom, dipper and dipper handle, of operating chain secured to dipper and passing over outboard end of boom, means for operating chain, box secured to boom and provided with lug, radial arm carried by boom and sliding in box, having its outer end bearing on operating chain between dipper and outboard end of boom, and being adapted to regulate working angle of operating

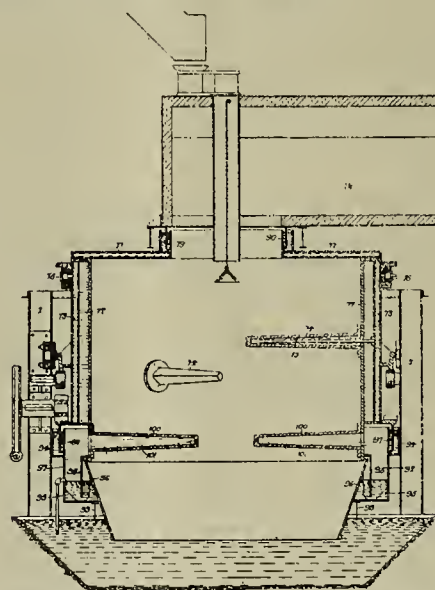
chain, arm having series of recesses adapted to receive lug, lug and recesses being adapted, when in engagement, to resist thrust of operating chain when arm is in operative position, and means adapted to close all but one of recesses against engagement with lug.

ROTARY CEMENT KILN.—No. 778,611; G. H. Sharp, Jonesville, Mich.



In rotary cement kiln combination with outer casing adapted to be rotated, of cylinder arranged within, and secured to casing, cylinder having inwardly and outwardly projecting shelving attached thereto, and casing having inwardly projecting shelving, shelving having its end turned upward at about right angles thereto, means to feed material to casing and cylinder, and means to rotate casing.

GAS PRODUCER.—No. 778,614; S. T. Wellman, C. H. Wellman and J. W. Seaver, Cleveland, O.



Combination in gas producer, of hollow stirring or agitating arm, rotating element of producer carrying same and having partition whereby it is divided into two chambers one of which communicates with hollow arms, pipes projecting into hollow arms and communicating with other of chambers, and means for supplying water to one of chambers and conveying it from other.

ART OF REDUCING ALUMINUM OR OTHER METALS.—No. 778,100; H. S. Blackmore, Mount Vernon, N. Y.

Process of reducing metals by exposing compound of metal to be reduced to action of substance having such superior affinity for electro-negative constituent of compound that heat is evolved in reduction and simultaneously employing heat to elevate other ingredients capable of reducing metal by endothermic reaction to temperature at which reduction is accomplished, and carrying on reduction by action of such ingredients.

ONE of the latest innovations in mining equipment is an air rock drill which is operated by an electrically driven air compressor situated a short distance from the working face, where the drill is in operation. The mechanism is not complex, but is a radical departure from other types of either compressed air or electric drills. The main features of this idea have been in use for some time past in Germany, but in the latest adaptation of this novelty no air receiver or storage reservoir is employed, the air used being kept in circulation and continually reused.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ARIZONA.

#### Gila County.

The Old Dominion smelters at Globe produced about 15,500,000 pounds of refined copper in 1904. It is thought that within four months all the surface improvements about the new shaft will be completed; also the 300-ton concentrator and the briquetting machines at the smelter for handling the blue dust. The smelter building is to be extended and a third converter stand and another electric crane put in, allowing the operation of three furnaces. The coke bin capacity above the smelter is being enlarged by extending the trestle 54 feet, which will give room for three more bins. The 70x17-foot concrete converter slag yard, with a floor of 2-inch iron plates for cooling the slag is almost done. The hoist is being moved forward 30 feet and 10 feet to the east. The pit and foundations for the belt conveyor, rock crushers and rolls have been finished; also eight steel ore bins south of the boiler house.

J. B. Coplen will superintend work on the Inspiration Copper Co.'s property at Globe. Two blowers, two gasoline engines, cars, track iron, etc., have been ordered.

The Trl-Bullion M. Co. has struck ore 7 miles south of San Carlos agency. In the main 1000-foot tunnel, a 12-foot lead was cut, carrying carbonates of copper and values in lead and silver.

#### Maricopa County.

(Special Correspondence).—L. R. Legier has men working his lead property northwest of Phoenix. Ore will be shipped to the smelter.—H. G. Bennett will put in a hoist, compressor and other machinery on his property near Morristown. The Mormon Girl mill on Cave creek is running full time on ore from the Mormon Girl mine.—Walker & Dunlap are having considerable work done on their property in Cave Creek district.—Work at the Relief mine is progressing in a satisfactory manner. The mill is in operation.—C. E. Philes is taking out ore from his Cave creek property which he will have milled.—J. Hauxhurst has gone to his copper property in the Osborn district, west of the Vulture mine.

Phoenix, Jan. 3.

(Special Correspondence).—The construction of a railroad from the Santa Fe, Prescott & Phoenix Railroad, above Wickenburg, towards the Colorado river is putting new life into the Wickenburg district. A smelter site below Wickenburg has been purchased and various properties in the district are being sampled. A number of properties around Wickenburg have recently changed hands.

Wickenburg, Jan. 2.

#### Pinal County.

J. Champion, superintendent of the Columbia Bell and Martinez, is thinking of putting up a concentrator and reduction plant and an aerial tramway at Cochran station, near Florence.

#### Yavapai County.

S. C. Symons, of the Verde Water & Power Co., is in Prescott regarding supplying of electric power for mining and other purposes from a plant at Parker's Butte, below Horseshoe reservoir, 75 miles from Prescott, which will generate 20,000 H. P.

At the White gold mine on the Hassayampa, 12 miles above Wickenburg, there are fifty men developing grading for a 20-stamp mill, cyanide plant and air compressors, and building a road between the mine and the S. F. P. & P. railroad. President Agnews of Valparaiso, Ind., is directing operations at the mine.

### CALIFORNIA.

During 1904 California produced 27,638 flasks of quick-silver.

There are fifteen oil fields in California. Statistics for September show:

	No. Productive Wells.	Output in Barrels.
Kern River.....	600	1,465,882
Coalinga.....	138	470,887
Santa Maria and Lompoc.....	18	46,380
Los Angeles.....	107,314	110,314
Fullerton.....	106	109,303
Puente.....	33	3,025
Whittier.....	83	40,245
Newhall.....	65	11,690
Ventura.....	255	49,475
Summerland.....	199	9,870
Sunset.....	31	21,650
Midway.....	33	Unreported
McKittrick.....	65	192,200
Sargents.....	3	6,150
Halfmoon Bay.....	...	...
Totals.....	2,763	2,546,081

It is estimated that the total petroleum output of California in 1904 amounted to 30,000,000 barrels.

There are three pipe lines carrying oil from California fields. The Standard Oil pipe line from Bakersfield to Point Richmond is nearly 300 miles long; the Coalinga pipe line to Monterey is 110 miles, and the pipe line carrying the output of the Santa Maria oil fields to tide water is 40 miles long.

#### Amador County.

The Ione & Eastern Railway Co., constructing from the terminus of the Southern Pacific at Ione to Sutter Creek and Jackson, has more than half completed its line and will extend it from Sutter Hill past Pine Grove and Volcano to timber which can be used in the mines at a price less than charged in San Francisco.

J. S. Smith of Sacramento proposes to build an electric line from Sacramento to Sutter Creek, past Elk Grove and through the Cosumnes valley.

#### Butte County.

A shaft is being sunk on the property of W. P. Lynch, near Pentz, for dredger prospecting purposes instead of drilling.

#### Calaveras County.

Ambleton Bros. & Co. are building a small quartz mill near Vallecito to crush rock from a pocket vein recently found.—A hoisting engine and boiler are being put up at the Barnasconi mine, near Fourth Crossing.

Near the Stanislaus river below Collierville, 6 miles east of Murphys, the Bourbon M. Co. has acquired water rights along the river and intend to transmit power into Sonora and other points by July. B. Thompson is the general manager. P. Copella of Douglas is local superintendent.

#### Mariposa County.

Near the Mariposa Estate, owned and operated by the Mariposa C. & M. Co., at Mount Bullion, Mariposa and Bagby, the Omparisa G. M. Co. is installing machinery at the Mountain King group, on the Merced river. A gravity tramway has been completed from the main tunnel to the millsite, a flume to carry water for the generation of electricity is being constructed, and the machinery for a large stamp mill is arriving.

At the Sweetwater mine new machinery and a 10-stamp mill have been received. In the old Quartzburg district, idle for years, capital has recently taken hold of prominent claims, among which are the Mount Gains, Exchequer and others. At Benton Mills, on the Merced river, the Mariposa C. & M. Co. is prospecting and running the old river tunnel toward the Pine Tree and Josephine mines. A 5-stamp mill for sampling was recently installed. This company's properties are all operated with electric power, the towns of Mariposa and Mount Bullion also being lighted thereby.

#### Placer County.

H. C. Armstrong will resume work at Canada Hill at the Golden West gravel mine in the spring. The tunnel is in 1300 feet and has struck the channel.

A Huntington mill and other machinery is being put in at the Buckeye, near Forest Hill.—At the Three Star-Almont mines, near Ophir, Superintendent B. F. Hartley is considering the advisability of doubling the mill capacity.—Ophir reports say that the Bouk has put in a 5-stamp mill.

#### Riverside County.

It is reported from Corona that the U. S. Tin M. Co. will put a copper plant on its Temescal tin mine holdings.

#### San Bernardino County.

At Daggett the Pacific Coast Borax Co. is doubling its capacity, and will again double the capacity during 1905. F. M. Smith is riding from Daggett to the Death Valley mines, and from there to Tonopah, following the proposed Tonopah tidewater railroad, which he is to construct. Surveyors are at work establishing the route. The proposed railroad will connect with the Salt Lake at Soda Lake.

#### San Luis Obispo County.

The Carissa Chemical Co. has been formed to exploit the borax deposits at Carissa lake, in eastern San Luis Obispo county, and ship the same to a refinery to be erected at Bakersfield, and has surveyed and staked 1500 acres of claims. A number of houses for the workmen have been built at the lake and two traction engines bought to haul the borax to Olig station, on the McKittrick branch of the Southern Pacific, whence it will be shipped to Bakersfield.

#### Shasta County.

G. Garwood of French Gulch was buried alive for nine hours on January 4th. Garwood and two mining partners, leasing the Pick-up mine, were in the French Gulch district running an upraise to connect one tunnel with another above. His pick struck an old fill and fine dirt rushed down, leaving him in a niche in the wall with barely room enough to turn around. His partners got twenty miners of the Washington mine to dig for nine hours, working in five-minute shifts—finally rescuing him uninjured, as enough air came from the old fill to keep him alive.

#### Sierra County.

At the Alaska mine at Pike City, in charge of G. St. John, the 450-foot vertical shaft will be retimbered and pumped dry. Machinery will be put in and run by electricity from the Colgate power house. A drain tunnel will be extended to tap the shaft and carry off the surface water.

#### Siskiyou County.

The late rains have caused a revival of hydraulic mining in Siskiyou county. The Minetta B. at Nulton is being worked with water from Thompson creek, a tributary of the Klamath, by T. J. Nulton, superintendent, and M. Gordon, foreman.—The Classic Hill, on the west branch of Indian creek, is being piped by J. C. Wood of Happy Camp.

#### Trinity County.

The 40 stamps at the Fairview mine, near Minersville, are run with power from Stuarts Fork. A contract has been let to run tunnel No. 4, which will strike the ledge 400 feet below tunnel No. 3, in which rich ore has been opened up. Tunnel No. 3 has been run in 1400 feet, in the face of the ledge.

#### Tuolumne County.

J. W. Burkitt of Arlington Heights, Ill., president of the Sierra G. M. Co., is expected to arrive in Groveland to start the mill and make improvements.

E. C. Loftus, manager of the Santa Ysabel, near Sonora, reports drifting going on on the 400 and 600 levels. The shaft is down 700 feet and will be sunk 1000 feet. The mill is being overhauled and put in shape.—Arrangements are being made to unwater the Belle mine at Tutletown.—The Mayflower mine is being developed by G. F. Bartlett.

At the Solsby mine water is increasing in the new works. It is thought that the water comes from the old claim.—The Black Oak mill is running with forty stamps, as all repairs on the mill have been completed.

It is expected that the forty stamps being added to

the mill of the Melones mine will be dropping in the spring, giving 100 stamps in all.

#### Ventura County.

The Columbia borax mine has been discovered in the Frazer mountains, 65 miles west of Lancaster. The company is planning to put a road through to Ventura. The borax is shipped from Lancaster to New Jersey, where it is refined. The ore lies in sheets between walls of clay and is shot down with giant powder and then sorted.

### COLORADO.

According to counties in 1904, Colorado produced:

County.	Gold.	Silver.	Copper.	Zinc.	Lead.	Total.
Adams.....	20,483	104,408	12,857	2,500	344	34,133,365
Alamosa.....	20,483	104,408	12,857	2,500	344	34,133,365
Antelope.....	20,483	104,408	12,857	2,500	344	34,133,365
Aspen.....	20,483	104,408	12,857	2,500	344	34,133,365
Battle.....	20,483	104,408	12,857	2,500	344	34,133,365
Boulder.....	20,483	104,408	12,857	2,500	344	34,133,365
Clear Creek.....	20,483	104,408	12,857	2,500	344	34,133,365
Crested Butte.....	20,483	104,408	12,857	2,500	344	34,133,365
Dolores.....	20,483	104,408	12,857	2,500	344	34,133,365
El Paso.....	20,483	104,408	12,857	2,500	344	34,133,365
Espey.....	20,483	104,408	12,857	2,500	344	34,133,365
Fowler.....	20,483	104,408	12,857	2,500	344	34,133,365
Grand.....	20,483	104,408	12,857	2,500	344	34,133,365
Idaho.....	20,483	104,408	12,857	2,500	344	34,133,365
Leadville.....	20,483	104,408	12,857	2,500	344	34,133,365
Monte Vista.....	20,483	104,408	12,857	2,500	344	34,133,365
Ouray.....	20,483	104,408	12,857	2,500	344	34,133,365
Pitkin.....	20,483	104,408	12,857	2,500	344	34,133,365
San Juan.....	20,483	104,408	12,857	2,500	344	34,133,365
Santa Cruz.....	20,483	104,408	12,857	2,500	344	34,133,365
Silver.....	20,483	104,408	12,857	2,500	344	34,133,365
Summit.....	20,483	104,408	12,857	2,500	344	34,133,365
Teller.....	20,483	104,408	12,857	2,500	344	34,133,365
Windsor.....	20,483	104,408	12,857	2,500	344	34,133,365
Yuma.....	20,483	104,408	12,857	2,500	344	34,133,365
Totals.....	\$28,151,669	\$3,908,215	\$1,721,483	\$1,122,578	\$3,887,969	\$40,555,111

The American S. & R. Co.'s plants at Globe, Pueblo, Eilers, Philadelphia, Arkansas Valley and Durango produced during 1904:

Locality.	Gold.	Silver.	Lead.	Copper.
Colorado.....	420,830	11,582,153	95,505,215	9,066,026
California.....	50	1	12,417	100
Central America.....	985	212,146	12,417	354,727
Idaho.....	3	3,230,145	97,185,131	588,935
Montana.....	194	16,140	588,935	...
Mexico.....	742	137,505	...	...
Nevada.....	12	1,275	...	...
New Mexico.....	36	4,068	39,788	6,493
South America.....	316	572,386	35,358	22,419
South Dakota.....	8,092	21,435	18,375	17,764
Utah.....	3,873	1,579,723	16,532,288	3,801,612
Wyoming.....	5	2	...	91
Totals.....	435,069	17,358,191	210,707,499	13,520,132

#### METAL VALUE.

Locality.	Gold.	Silver.	Lead.	Copper.
Colorado.....	\$8,698,349	\$6,623,833	\$4,178,353	\$1,133,365
California.....	20	308	5	12
Central America.....	20,359	121,326	2	...
Idaho.....	45,667	1,847,319	4,251,349	44,340
Montana.....	4,000	0,354	37,578	...
Mexico.....	15,337	78,753	...	...
Nevada.....	248	729	...	...
New Mexico.....	537	2,326	1,740	811
South America.....	6,351	327,463	24,298	34,052
South Dakota.....	167,251	12,258	799	2,220
Utah.....	80,054	993,443	723,287	475,301
Wyoming.....	103	1	...	11
Totals.....	\$8,992,681	\$9,927,149	\$9,218,453	\$1,690,016

Locality.	Total Metal Value.
Colorado.....	\$30,653,901
California.....	142,229
Central America.....	6,143,572
Idaho.....	50,973
Montana.....	94,000
Mexico.....	97
New Mexico.....	5,416
South America.....	32,346
South Dakota.....	182,540
Utah.....	2,181,987
Wyoming.....	115
Total.....	\$30,823,495

#### VALUES FROM COLORADO ORES.

County.	Gold.	Silver.	Lead.	Copper.
Boulder.....	7,352	28,676	59,506	615
Clear Creek.....	10,048	710,789	4,241,166	215,334
Lake.....	45,667	4,628,224	38,570,161	4,133,538
Mineral.....	9,062	1,619,587	11,403,630	1,287
Ouray.....	17,588	232,112	1,848,073	419,837
Pitkin.....	17	1,999,049	18,359,813	10,361
San Juan.....	39,721	600,386	9,394,851	2,464,540
San Miguel.....	19,643	617,432	5,643,814	237,102
Summit.....	4,265	149,473	2,174,062	1,347
Teller.....	230,931	39,295	...	...
Totals.....	394,464	10,985,023	91,695,376	8,881,051

#### OHIO SMELTING PLANT AT SALIDA.

The Ohio & Colorado S. & R. Co. at Salida during 1904 produced:

Colorado.	Gold.	Silver.	Lead.	Copper.
Summit county.....	36	2,520	...	...
Saguache county.....	69	8,699	13,051	...
Chaffee county.....	214	18,708	294,683	4,109
Hinsdale county.....	70	37,293	805,837	1,756
Mineral county.....	181	5,475	1,822,718	...
Eagle county.....	285	12,383	...	16,428
Custer county.....	983	20,442	8,061	...
Gunnison county.....	58	25	...	...
Ouray county.....	93	1,971	2,166	79
Lake county.....	14,442	457,114	4,731,582	125,190
Total.....	16,439	554,632	7,588,106	117,562
Idaho.....	16	573,951	22,010,257	...
Utah.....	1,190	262,878	7,461,580	...
Total.....	17,645	1,391,461	37,059,952	147,562

#### VALUE OF CONTENTS.

Gold, 17,645 ounces, at \$20.67.....	\$364,732
Silver, 1,391,461 ounces, at \$7.25 cents.....	796,611
Lead, 18,530 tons, at \$87.50 per ton.....	1,621,375
Copper, 147,562 pounds, at 12.5 cents.....	18,445
Total value for 1904.....	\$2,801,163



## REPORT OF ARGO SMELTER.

The Boston & Colorado S. Co. at Argo in 1904 produced:

Ore Supply.	Gold.	Silver.	Copper.	Total.
Colorado.....	\$1,347,218	\$245,296	\$101,556	\$1,694,071
Other States.....	134	2,018	100,064	102,217
Total.....	\$1,347,353	\$247,315	\$201,620	\$1,796,289
Gold, 65,184 ounces, at \$20.67.....	\$1,347,353			
Silver, 131,992 ounces, at 57.25 cents.....		247,315		
Copper, 1,612,961 pounds, at 12.5 cents.....			201,620	
Total value for year.....				\$1,796,289

The following is Colorado's mineral production for 1904:

Sources of Production.	Gold.	Silver.	Lead.	Copper.	Totals.
American Smelting & Refining Co. (Colorado plants).....	\$ 8,698,249	\$6,623,833	\$4,178,353	\$1,133,165	\$20,633,701
Ohio & Colorado S. & R. Co. (Salida).....	389,804	317,180	331,979	18,445	1,007,409
Boston & Colorado (Argo).....	1,347,218	245,296	101,556	101,556	1,694,071
Independent S. & R. (Golden).....	155,525	20,152	21,000	205,676	205,676
U. S. Mint, Denver (excluding shipments from Colorado plants).....	13,019,984	44,000			13,059,984
E. E. Burlingame & Co.....	472,261	12,000			484,261
Smelters and Refineries, Mints and Assay Offices, outside of Colorado.....	2,650,000	50,000			2,700,000
Estimated value of Zinc output.....					8,000,000
Clay and Miscellaneous Mineral Products, etc.....					21,000,000
Total.....					\$68,785,114

During 1904 the oil industry of Colorado has been in a prosperous condition, making an average production of 1800 barrels per day, 1700 barrels being produced in the oil fields at Florence and 100 around Boulder, or an annual total of 650,000 barrels of crude oil. There are 35 producing wells at Florence and 5 at Boulder, under the control of the United Oil Co., the entire product of both fields being refined at Florence.

## Boulder County.

The Eldora branch of the Colorado Northwestern road, running 33 miles, from Boulder to Eldora, has been completed in four months' time. Formerly the Boulder County mine and the tungsten properties have freighted ore by team 33 miles to Boulder at \$6 a ton. On the new railroad, ore can be shipped to Boulder for 50 cents a ton, and to Denver for \$1.75 a ton.

## Clear Creek County.

(Special Correspondence).—The Red Oak G. M. & M. Co., operating on Democrat mountain, near Georgetown, has let a contract to drive a 400-foot upraise from the Scepter tunnel to the Sunburst. With this opening they will be able to bring the ore down through Democrat mountain, instead of around as at present. During the winter months it is almost impossible to haul ore from the Sunburst on account of the heavy snow on the north side of the mountain. This company now has over 7000 feet of tunnel work on their property. They opened up a good body of high-grade silver ore a few days ago. Georgetown, Jan. 2.

The Chamberlain-Dillingham Ore Co. at Georgetown report having purchased 412,840 ounces silver, 888 ounces gold, 1,793,637 pounds lead; copper, \$2000; zinc, \$8000; shipped direct to smelters, \$75,000; total, \$419,342; This is an increase of over \$100,000 during 1904.

## Ouray County.

W. J. Hammond, Jr., manager of the Treasury T. Co. at Ouray, will add ten stamps to their new mill, making twenty in all. The electric power plant, run by 2700 gallons per minute of water from the tunnel, has been finished. The tunnel is in 5300 feet and seventy-five men are at work.

## San Juan County.

A. W. Harrison has charge of the survey for a tram line to connect the Grand Mogul with a mill to be built on Cement creek below Gladstone.

During 1904 San Juan county shipped 66,288 tons of ore and concentrates, as follows:

Silver Lake, concentrates, 18,600 tons, at \$48 per ton.....	\$ 892,800
Gold King, concentrates, 18,000 tons, at \$42 per ton.....	756,000
Sunnyside, concentrates, 5100 tons, at \$22 per ton.....	113,520
Silver Ledge, concentrates, zinc, lead and iron, 1978 tons, at \$27 per ton.....	53,406
North Star (Sultan mountain), crude, 1600 tons, at \$24 per ton.....	38,400
Shenandoah No. 3, crude, 750 tons, at \$65 per ton.....	48,750
Champion (Sultan mountain), crude, 318 tons, at \$38 per ton.....	10,494
Highland Mary, concentrates, 400 tons, at \$30 per ton.....	12,000
North Star (King Solomon mountain), Carson lease, 122 tons, \$3000; Kearns lease, 21 tons, \$3000; Dives, 48 tons, \$2000; Nicholson lease, 72 tons, \$2000; Benjosky lease, 96 tons, \$2000; Black Canyon, 48 tons, \$1400, and North Star Fraction, 96 tons, \$1000—total, 576 tons, crude.....	16,400
Amalgam and bullion from mills.....	571,000
Smaller producers.....	807,400
Total.....	\$3,320,170

Length of tram lines in feet are: Iowa G. M. & M. Co., 16,600; Sunnyside, 16,000; Silver Lake, 14,700; Silver Lake, Unity tunnel, 6000; Silver Lake, from Midway to mill, 2000; Gold King, 3300; Silver Ledge, 4000; Old Hundred, 4000; Royal M. Co., 1000; Thunder tunnel, 1500; Contention, 5300; Honrietta, 5460.

## San Miguel County.

The estimated mineral production of San Miguel county for 1904 is distributed as follows:

Tomboy Gold Mines Co.....	\$ 600,000
Smuggler-Union M. Co.....	500,000
Liberty Bell G. M. Co.....	400,000
Alta Mines Co.....	200,000
Nellie M. Co.....	150,000
Keystone Hydraulic Placer M. Co.....	50,000
Butterfly-Terrible G. M. Co.....	150,000
Opbir Con. M. Co.....	125,000
Yellow Mountain M. & M. Co.....	125,000
Suffolk Lode M. & M. Co.....	25,000
Carbonero mine.....	50,000
San Bernardino mine.....	20,000
Miscellaneous.....	105,000
Total.....	\$2,500,000

## Summit County.

The placers being worked near Breckenridge this season are the Revett gold dredging boat of the Reliance Gold Dredging Co. on French creek; the Summit Banner Placer M. & M. Co., L. Kingsbury manager; the Bemrose placers of Hoosier gulch by the Hoosier Creek M. & M. Co.; the Mekka Co., completing its 2100-foot drainage sluiceway; the American Gold Dredging Co. on the Swan river and Gold run, and the Gold Pan and Oro Grande in the Blue valley.

The Admiral G. M. Co., on lower Ten Mile, between Frisco and Wheeler, has run its crosscut tunnel 1500

feet.—The Copper Queen at Frisco is being developed by the Mary Verna Co. of Tennessee. An 800-foot crosscut tunnel is being run to tap the vein.—The capacity of the Quandy Mountain M. & M. Co.'s mill, operating on ore from the Monte Cristo, is to be doubled.—The new separation and concentration mill of the Old Union M. & M. Co. is almost completed. It will treat ore from the company's property on Mineral hill, and also custom ore.

A. E. Kaebles is manager and G. C. Smith superintendent of the mine on Mineral hill, near Breckenridge.

## Teller County.

The Merger G. M. Co. will reopen the Ruby mine, Bull hill, and the Bonnie Nell, Raven hill, Cripple Creek. W. J. Stark will manage both properties.

Taber & Sutton are putting in a hoist, hoiler and 6-drill compressor on the Helena of the Pilgrim Co.

During 1904 five cyanide plants were built near Cripple Creek: King & Craig on the Anaconda-Cripple Creek Homestake, which has the largest plant in the camp, and is now enlarging its capacity to treat 1000 tons daily; the R. E. A. & A., mining and cyaniding on the Wild Horse property; the Santa Rita, Gillett and Michorad. Russell & Rice will build a 1000-ton cyanide mill on Globe hill; C. B. Burch will build on the Little Giant property. The Lincoln of Cripple Creek cyanide plant is nearly completed.

## IDAHO.

State Mine Inspector R. N. Bell of Idaho has issued a statement showing the estimated metal production of last year to be as follows:

Gold, fine ounces.....	\$1,461.89
Silver, fine ounces.....	\$284,639.12
Lead, pounds.....	226,361,728.00
Copper, pounds.....	5,422,007.05

## Blaine County.

The tunnel being driven to tap the Red Elephant veins is in 900 feet, 600 feet remaining to be driven. The mill is running twelve hours a day, but will be run continuously when the tunnel is completed. An 80 H. P. boiler has been substituted for water power in running the mill and the compressor.

## Boise County.

C. M. Mullen is developing claims near Pearl.

## Custer County.

The White Knob Copper Co. is driving the main tunnel on its property near Mackay.

## Idaho County.

E. M. Aldrich is manager at Elk City of a New York company working on east fork of Crooked river, near Oro Grande. They may put in a 100-ton plant.—A 250-foot tunnel is being run on the Oro Grande group, 2 miles northeast of Elk City, under management of C. E. Svenson of Elk City. C. Brinton of Lewiston is owner.

## Lemhi County.

G. M. McKenney, manager of the Oregon-Idaho G. M. Co., operating the Singiser mine, near Salmon, says that the company has started up the mill and will open up the property during the winter.

## Owyhee County.

It is reported that an 8-foot vein of good bituminous coal has been found at a depth of 600 feet, near Bruneau.

## Shoshone County.

(Special Correspondence).—Owing to a disagreement involving right of way, the long lower tunnel recently projected by the Gold Hunter M. Co. of Mullan has been indefinitely postponed.

The Little Chief M. Co., through whose ground the tunnel must be driven to reach the Hunter vein, have asked such privileges for grant of right of way as the Hunter people are not disposed to concede. The tunnel, if driven, would do away with the tramway and bring the ore out to the mill.—The Hecla has declared an extra dividend of \$30,000 in commemoration of Christmas. This is in addition to the regular \$10,000 monthly distribution. The mine is at Burke, west of the Old Tiger-Poorman, the first mine discovered in the Canyon creek section of the Cœur d'Alenes.—The Stewart mine, on Stewart gulch, west of Wardner, is shipping a car of ore per month. The property appears to be the west extension of the Bunker Hill & Sullivan and the Last Chance lode. The ore now being extracted comes from tunnel No. 2. Tunnel No. 3, 250 feet vertically below No. 2, is being extended under the shoot now being worked in the tunnel above; it is expected to reach the objective point next month. H. F. Samuels, an owner in the Hercules mine at Burke, is the president and manager.—Supt. Fuller says that the Headlight Co. has a 5-foot face of concentrating ore on the foot wall side of the vein. The property adjoins the Mammoth mine on the west.—It is now proposed to start, in conjunction with Big Divide M. Co., a long tunnel from the canyon to the town of Black Bear. This will put the ores practically on the railroad and cut the vein at a farther depth of several hundred feet. The proposed new tunnel is estimated to be 2000 feet long when complete. An air compressor goes in. A McCullom, formerly foreman of the Standard mine at Mace, is the manager.—The various mining companies will pay into the treasury of Shoshone county this year the aggregate sum of \$99,119.24. Taxes are based upon net profits and improvements.

Wallace, Dec. 31.

At the Samson group on Big creek, near Wardner, the tunnel is in 100 feet. J. L. Safford is manager.

## Washington County.

The Ladd Metals Co. of Portland put in a smelter at

Landore last summer to treat the ores of the Seven Devils district and unsuccessfully experimented with a wood-gas converter for firing the stacks. The company has since rebuilt the smelting plant, enlarged its capacity and will now use coke for smelting.

The Iron Springs Con. M. Co., organized with office at Weiser, Idaho, and Eastern office at Youngstown, O., with a capital stock of \$5,000,000, purchased all of the properties owned by the Iron Springs M. Co., the Pacolian M. Co., the Holbrook M. Co., a controlling interest in the Iron Mountain M. & R. Co. and other properties near Iron Springs owned by individuals, on Rapid river and Bear creek. D. C. Nevin is president and manager at Weiser, Idaho; J. E. Stewart, first vice-president, Wooster, O.; H. G. Bye, second vice-president, Youngstown, O.; W. P. Barnum, secretary, Youngstown, O.; H. F. March, assistant secretary, Weiser, Idaho; J. F. Nevin, treasurer, Youngstown, O., and J. C. Sutherland, assistant treasurer, Weiser, Idaho. The company plans to put a 100-ton cyanide plant on the Iron Springs Co., will complete the wagon road from Iron Springs to Pollock and will put in an electric power plant on Rapid river. C. H. Dennison is superintendent at Iron Springs and J. B. Bye on surrounding properties.

## MICHIGAN.

(Special Correspondence).—The approximate production of the Lake Superior mines in 1904 was:

Mine.	Pounds.	Dividends.
Calumet & Hecla.....	79,000,000	\$4,000,000
Oscuela.....	20,500,000	192,300
Quincy.....	18,225,000	500,000
Tamarack.....	14,000,000	90,000
Champion.....	12,250,000	300,000
Baltic.....	11,900,000	
Trimountain.....	11,500,000	
Wolverine.....	9,850,000	450,000
Mohawk.....	8,400,000	
Atlantic.....	5,100,000	
Franklin.....	5,050,000	
Isle Royale.....	2,500,000	
Mass.....	2,450,000	
Michigan.....	2,400,000	
Phoenix.....	1,250,000	
Centennial.....	1,100,000	
Adventure.....	725,000	
Winona.....	550,000	
Ahmek.....	300,000	
Miscellaneous.....	50,000	
Total.....	206,900,000	

At present there are 16,000 men employed in copper mining on Lake Superior.

Beginning at the end of the Lake Superior belt: At the Phoenix work on the west vein has been abandoned and the St. Clair is being worked to partially feed the mill. The Ashbed may be opened to get enough rock. The Mohawk, one of whose shaft houses was burned, is in excellent condition. Its four producing shafts are almost equipped. Sinking on shaft No. 5 has been stopped. A shaft house is completed. South of the Mohawk the Ahmek has two shafts down and is shipping 160 tons daily from the extension of drift stopes. A second shaft is being started by the Allouez to tap the Kearsarge lode. The first will cut the bed in February. At the North and South Kearsarge mines and the Osceola branch the stamp mills have been improved and \$75,000 will be spent during 1905 to convert the heads. Wolverine is making the cheapest copper on Lake Superior, pays good dividends and maintains its production. At the Centennial production has been small, owing to the treatment of the surface accumulation. The Miskwabik and Bohemian range companies are exploring north of the Mohawk. The Mayflower and Old Colony companies are searching for paying lodes. At the Calumet & Hecla work has been resumed at No. 13 shaft on the Osceola amygdaloid. The stamp mills are being remodeled. Two shafts have been sunk in the Kearsarge lode and a third on the corner of the property for exploring. No. 19 is shipping rock regularly and No. 20 will begin in a short time. A power plant will be built at Lake Linden to supply electricity for the mines and mills.

At the Tamarack No. 2, shaft has been repaired and is producing copper.

On the Laurium two diamond drill borings have been completed and a third is now in progress.

The Tecumseh shows no signs of becoming active. The Rhode Island is exploring with indifferent results. The Franklin is in excellent shape and its new shaft at the Junior mine is penetrating good ground. The Quincy has made improvements in mine, mill and smelter. No. 8 shaft on the Mesnard property will probably be producing by the end of 1905.

At the Isle Royale a 150-foot shaft has been opened in Section 11.

The Atlantic has worked the more profitable stretches of ground. The Superior Copper Co. is down 90 feet. Baltic is operating normally. Trimountain is improving. Cbampan has ample drill capacity and is pushing development. It is enlarging its mill. Work on the Globe, owned by J. Stanton, may be resumed next spring. The St. Mary's Mineral Land Co. is sinking a drop shaft on its Challenge property, south of the Globe. The Elm River is exploring in No. 1 shaft. Wyandot is investigating a new hed uncovered in Misery river. Winona has discontinued production to develop its property.

Adventure's output has increased during the past six months. The Evergreen lode is being opened up. The Mass is developing shafts A, B and C. The Michigan is utilizing one head at the Mass mill and developing its ground. The Branch vein and Calico lode are doing well. The Victoria is doing surface work, as rock shipments can be made for five years without further development. A stamp mill is being built from the salvage of the Belt mill.

The Copper Crown M. Co. of St. Louis, Mo., is working the Hamilton.

Calumet, Jan. 1.

## MONTANA.

## Fergus County.

A 100-ton plant will be put up to treat ores from the mines at Kendall, owned by G. H. Stanton and H. Armstrong of Great Falls. Armstrong has charge at Kendall.

## Jefferson County.

The First Chance mine, above Deer Lodge, 4 miles from Basin, is owned and operated by J. C. Cope, A. S.



& W. Kilburn and W. Dodge, and has been developed by a 225-foot tunnel.

Madison County.

The Moonlight M. & Dev. Co. has been organized at Twin Bridges by D. F. Wheeler, president, and S. Thompson, secretary and treasurer.—The Groene-Campbell Con. G. M. Co. will build a 15-stamp mill on its property at Silver Star in the spring.

MISSOURI.

Jasper County.

The output of zinc in the Joplin district for 1904 was about 275,000 tons, valued at \$10,000,000. The lead output will aggregate 35,000 tons of ore, valued at almost \$2,000,000.

NEVADA.

Esmeralda County.

Manager Clark of the Bullfrog M. Co. at Amargosa states that the location work has been completed on the forty-five claims belonging to the company, and a 700-foot tunnel has been started to crosscut the ledge. Ore is being sacked from the shaft on the Ladd Mountain group, and a shipment will be made to test as to the best methods of reduction. The company is drawing plans for a milling plant. The surveys have been made for the pipe line.

E. A. Doran of Goldfield and Los Angeles, Cal., men will build a 25-ton stamp mill between Goldfield and Columbia.

J. E. Spiking will put in a 5-stamp mill on Ramsey street, Goldfield. It has been in use for five years 7 miles west of Lida.

Washoe County.

At Dogskin, 20 miles north of Reno, J. W. Solley, manager of the Salt Lake & Reno M. & M. Co., is working six men on their copper claims.

NEW MEXICO.

In reviewing the mineral production for 1904, the Santa Fe New Mexican says that the Director of the Mint reports the gold and silver production of New Mexico does not reach \$500,000, while there has been a loss in the production of copper, turquoise, iron and other minerals and metals. This decline in mining is offset by the great increase in the production of coal, which, during 1904, was almost 2,000,000 tons.

Socorro County.

It is reported that the leaching plant of the Dividend M. & M. Co. at Estey City will be moved to Alamogordo.

Grant County.

The Imperial M. & S. Co. has been formed to work properties at Shakespear, in the Lordsburg district. C. Yaeger of Lordsburg is New Mexico agent.

OREGON.

Josephine County.

C. B. Hanson, superintendent of the Opp mill, Jacksonville, says that the new 10-stamp mill is working satisfactorily. The amalgamators are F. Hale and J. H. Erskine. J. W. Opp of Jacksonville, J. F. Reddy and F. T. Perry are owners, and are contemplating putting in ten more stamps. Electric motors, with current from Gold Ray station, run the crusher, the stamps and the amalgamators.—The 10-stamp mill at the Lucky Queen on Jump-off-Joe, C. D. Crane of Grants Pass, manager, will be in operation in February. A turbine wheel, with water from Jump-off-Joe creek, having a 30-foot head, will run the mill during the winter months. The mine will be lighted by electricity.—At Fiddlers gulch J. H. Wittrock of Grants Pass is working the Pinal mine with an arrastra run by a 17-foot overshot wheel.—Piping has begun at the Booth & Dysert placer on Jump-off-Joe with three giants. J. Dyser is superintendent. H. W. Miller and C. T. Davidson of Jacksonville have leased the Howland & Cook placer mine on Forest creek. J. Davies has leased the Snauldinger placer mine on Forest creek and will operate it this winter.—E. H. Perkins of Wolf Creek, H. A. Perkins and A. C. Spence have leased for three years the Marshall placer mine on Coyote creek from W. Paine of Waldo. At the Gold Flat, reached from Reuben's siding, 3 miles of ditch is completed and 2 miles to finish. Operations will be commenced by end of January. Mr. Henley of Virginia City, Nev., is superintendent, A. W. Shearer, foreman.

UTAH.

Beaver County.

The Frisco Contact M. Co., D. P. Rohlfing, manager, ordered a 500-foot hoisting plant for the shaft on the extension of the Horn Silver vein.

The Majestic Co. of Milford, E. F. Freudenthal superintendent, is developing the O. K., Old Hickory and Harrington-Hickory mines with 100 men.

Juab County

The Uncle Sam mine at Tintic may put in an air compressor.

Tintic shipments for 1904 were:

Carloads	Carloads
Ajax.....117	Oshorne.....1
Anderson & Jensen.....1	Salvator.....25
Bullion-Beck.....318	Showers.....1
B. R. Smoot.....1	Star Con.....46
Carlsbad.....171	South Swansea.....40
Centennial-Eureka.....2342	Tetro.....79
Cornucopia.....2	United Sunbeam.....6
Dragon Iron Mine.....174	Utah.....1
Eureka Hill.....35	R. A. Brown.....13
Eagle & Blue Bell.....153	Uncle Sam.....99
Erasmack & Co.....83	Yankee Con.....226
Gemini.....83	Victor.....58
Grand Central.....674	Victoria.....5
Godiva.....39	W. B. Ellis.....1
Garnet.....1	
Hopes.....2	CONCENTRATES.
Joe Bowers.....2	Manmoth Mill.....6
Lower Mammoth.....16	Eureka Hill Mill.....16
LaCade.....9	Uncle Sam Mill.....139
L. F. Riter & Co.....3	
Martha Washington.....6	BULLION.
Monterey.....1	
Mammoth.....370	Eureka Hill Mill.....41
May Day.....37	Mammoth Mill.....1

Summit County.

The Wabash M. Co. at Park City will order an air compressing plant of two units, each of a capacity of 22,000 to 25,000 cubic feet of air per minute.

During 1904 Summit county's biggest ore shippers were: Daly-West, 129,815,000 pounds; Silver King, 121,570,000; Ontario, 13,057,000; Kearns-Keith, 8,640,000; Woodside, 349,000; Crescent, 312,000; New York, 246,000; sundry, 2,696,000. Total, 276,665,000.

SOUTH DAKOTA.

Pennington County.

F. H. Long of Chicago, Ill., operating the Bullion mine at Keystone, expects to build a mill early in the spring.

WYOMING.

Wyoming during 1904 produced:

Coal, 1,820,533 tons, valued at.....	\$14,461,599
Gold.....	800,000
Copper, 7,000,000 pounds, valued at.....	1,050,000
Silver.....	50,000
Iron, 150,000 tons, valued at.....	250,000
Building stone, etc.....	100,000
Total.....	\$10,711,599

Coal statistics are:

Mine.	Tonnage.	No. of Men Employed.
Rock Springs, No. 1.....	331,119	542
Rock Springs, No. 7.....	270,229	328
Rock Springs, No. 8.....	301,276	328
Rock Springs, No. 10.....	336,016	275
Rock Springs, No. 9.....	265,323	337
Diamondville, No. 1.....	331,549	296
Cumoreland, No. 1.....	457,689	425
Diamondville, No. 2.....	181,571	183
Diamondville, No. 4.....	14,140	8
Cumoreland, No. 2.....	455,333	341
Kemmerer, No. 1.....	181,312	255
Kemmerer, No. 3.....	50,463	78
Spring Valley, No. 1.....	119,511	190
Spring Valley, No. 2.....	114,570	180
Hanna, No. 1.....	262,102	485
Willow Creek, No. 4.....	500	10
Willow Creek, No. 5.....	2,830	10
Atmy, No. 5.....	7,100	20
Diets, No. 1 and No. 2.....	426,153	500
Cambrria, Antelope and Jumbo.....	396,567	600
Glenrock.....	60,440	185
Big Muddy.....	12,087	62
Aladdin.....	8,808	30
Monarch.....	108,569	300
All others (estimate).....	25,000	100
Totals for State.....	4,820,533	6,031

The Grand Encampment and Battle Lake districts were the chief copper producers. The greater part of the gold production came from the South Pass and Atlantic districts. Silver was not obtained except as a by-product.

Converse County.

The Douglas Oil Co., operating in Brenning basin, 12 miles from Douglas, have found a deposit of paraffine 3 feet in thickness, while drilling for oil.

FOREIGN.

BRITISH COLUMBIA.

Boundary District.

A compressor is being put in at the Betts & Hesperus group on Hardy mountain, 5 miles from Grand Forks, by Superintendent T. H. Rae.—At the Brooklyn & Stemwinder group, in Phoenix, Superintendent Collins will make a raise from the 250-foot level of the Brooklyn to the surface.—The Canadian Pacific, the Spokane Falls & Northern and the Kettle Valley Lines have issued joint ore rates from Ymir, B. C., and Chewelah, Wash., to Boundary smelters. The rate on \$15 ore from either point is \$1.75 per ton. The rate on \$10 ore from Ymir is \$1.50 per ton, and on \$25 ore \$2.50 per ton.—Ten blast furnaces in three Boundary smelters are now in operation—six at the Granby, two at the B. C. Copper and two at the Montreal & Boston. An underground telephone system has been put in the Granby mines.

Cariboo District.

(Special Correspondence).—The Slough Creek Ltd., developing the auriferous gravels in the Slough Creek region, has been placed in the hands of J. Gerdwood as receiver and manager. J. D. Kendall, employed by Glasgow people to examine the property, has reported favorably, stating that capital is necessary for development. A new company has been formed to continue the work.

Barkerville, Dec. 28.

Slocan District.

The Rossland Miner gives the following complete list of silver-lead mines in Kootenay that have paid dividends:

Payne.....	\$1,420,000	Noble Five.....	50,000.
Slocan Star.....	400,000	Goodenough.....	45,188
Idaho.....	100,000	Washington.....	38,000
Reco.....	287,500	Monitor.....	27,000
Rambler-Cariboo.....	220,000	Queen Bess.....	25,000
Last Chance.....	213,109	Jackson.....	20,000
Whitewater.....	208,000	Surprise.....	20,000
Ruth.....	125,000	Bosun.....	12,000
Sunset.....	68,000	Antoine.....	10,000
Total.....			\$4,763,297

The dispute between the Last Chance M. Co. and the Noble Five Co. has been settled out of court. The Noble Five is likely to start up in the spring, with W. H. Sandiford in charge.—Work has begun in the No. 2 tunnel of the Last Chance. Manager Pratt intends to resume operations in the upper workings.

CANADA.

Quebec.

Electricity has been substituted for steam at the Eustis mine at Capelton. The power house is on the Coaticook river, 1 mile above the Massawippi. Two 450 H. P. Crocker turbine wheels are supplied under 36 feet head with water from a 15-foot wooden dam 340 feet above the power house. The turbine shaft is direct connected to a 3-phase 200 K. W. Westinghouse generator supplying current at 2200 volts, 25 cycles, to motors for the air compressors, rock crusher and hoist. The 2-stage Rand class D-2, cross compound compressor belt is driven by a 100 H. P. Westinghouse, 2000 volt, constant speed, induction motor. The hoist is at the end of a 1000-foot

adit tunnel, through which power is carried by three No. 4 weather proof wires in a wooden box bolted to the rock wall of the tunnel. It has two cast iron drums, 72x48 inches, mounted on separate shafts and driven by a Westinghouse 150 H. P. 3-phase, 2000 volt, type F, variable speed induction motor, with a normal speed of 480 revolutions a minute. The total load hoisted is seven and one-half to eight tons. The shaft is 2000 feet on the incline. Starting the load with motor at rest requires 194 H. P. for twenty seconds to bring to full speed, but if the motor be started light and after fair speed is reached the load be picked up with the friction gear, the instantaneous starting current will be 96 H. P. for five seconds, 126 H. P. for ten seconds after starting with load on, and 107 H. P. to hoist at full speed. The main crushing plant has not been finished, but will be driven by 2000-volt motors. A 50 H. P. 200-volt slow speed induction motor drives a 20x6 crusher and rolls for temporary use.

MEXICO.

Michoacan.

(Special Correspondence).—E. B. Sanderson and J. M. Hillyer, with M. Morales as engineer, have denounced twelve pertenencias in the Arrio district, on the Los Pozos mineral belt, at the head of the placers in the Arroya Blanca and Rio de Chuta. The Los Pozos mineral belt can be traced from the Cerro del Agua, east of Tumbiscatio, to near the mouth of the Rio de Chuta, on the Pacific coast. The ground denounced consists of an immense iron blow-out occurring where a ledge of slate intersects the mineral belt at acute angles. The claim was worked extensively by the antiquas, the district taking the name Los Pozos (the holes) from the result of their operations. Near an antiqua cut a boulder was picked up recently, from which two assays run \$97,541.50 and \$75,445.50, respectively, carrying also a trace of cinabar. The values are found in stringers of white iron, which leads to pockets of granulated quartz and slate containing coarse free gold. Eight men are at work making cuts and stripping the ledge in antiqua style.—C. Ruiz has three arrastras at work grinding ore from his claim in the Arroya Honda, near Aguindo. Carrizal, Dec. 30.

Sonora.

(Special Correspondence).—M. P. Jacobson, proprietor of the Argano mine, near Nacozari, has received information that a 4-foot vein has been struck, assaying from 200 to 600 ounces of silver. The shaft has reached a depth of 125 feet.—Work on the Santo Domingo mine has been suspended and the pumps have been drawn temporarily. The Santo Domingo, in the Ajo mountains, 40 miles south of Cananea, is a silver-producing property. It is understood that the immediate cause of suspending work was the encountering of water in such quantities as to make further development operations very expensive.—A prospector claims to have discovered a valuable deposit of copper ore, with a trace of gold and silver, in a canyon northwest of Cananea, the erosion of the water having uncovered a vein 100 feet in depth and 600 feet long. Cananea, Dec. 30.

SOUTH AMERICA.

Chili.

Chili has two copper belts 100 miles apart, running north and south, largely through faulted sandstones upheaved by eruptive diorites. The principal developments have been made in the coastal belts, because of the greater ease of exploitation and transportation, the Cordilleran belt being very difficult of access. The accompanying information of mineral development is taken from a recent consular report. In the Checo district the Copiapo Co. has been working the Descubridora mine at Copiapo, Atacama, since 1825. In 1903 it produced 10,160 tons of 16% copper. The same company is working the Dulcinea, the Farellon and the Candelaria, in Puquitos district, and the San Francisco, Antonia and Carmen Alto in Ojancos district. W. T. Holberton is mine manager.

The Ojancos M. Co., under the control of Gibbs & Co., are interested in the Transito and Andacollo mines. The Tierra Amarilla and Bateas mines in Copiapo are worked by the Sociedad Industrial de Atacama, which own the Lautaro mine at Amolano in the San Antonio district. The chief gold mines outside the Inca district are the Jesus Maria, near Copiapo, and El Guanaco, near Taltal, though work at the latter is suspended owing to the change in the ores from gold to copper and to the flooding of the lower workings. Silver is worked in the Elisa mine at Bordes in the Sierra Amarilla. This mine supplies the State mint and produced last year 7339 kilos of bar silver from 10,011 tons of ore. The reduction works are at Pahellon and Tortoraillo, Freiberg barrel method being used. In the Taltal district, two silver mines owned by La Compania de Minas y Beneficiadora de Taltal, owners of El Guanaco mines, have been equipped with concentrating machinery to work low-grade ores. The cobalt mines of the district have been pinched out. Important borate fields are said to belong to the Borax Con., Ltd., to be held in view of future contingencies. Sulphur occurs in same district and is worked to supply material for the manufacture of gunpowder, used to blast the nitrate beds. Cobalt, borate of lime and sulphur occur in Copiapo. Sulphate of alumina is found near Yeso, in the Tierra Amarilla, in the department of Copiapo, which it is proposed to calcine at Pahellon and refine at Caldera. Large deposits of iron in the form of wide lodes exist throughout this department, the principal ores being hematite and magnetite of a very high percentage and remarkably free from foreign elements. They are not worked. Hitherto only those lodes carrying also a low percentage of copper have been mined, merely for use as a flux in the smelting of copper ores, and have been obtained principally from Patacones district, close to Copiapo.

La Sociedad Industrial de Atacama has a smelter in Tierra Amarilla which treated 17,526 tons of ore in 1903, also a branch at Caldera. La Compania Exploradora de Lota y Coronel smelter can output 5300 tons of refined copper a year. A copper smelter also exists at Tacna, in the north of the State. A Chilean company has a smelter



almost ready at Paihote, near Copiapo. Lixiviation is practiced by the Copiapo Co. at Puquios and there is a plant at Tortorillo which is being enlarged. At Taltal the reduction of high and low grade copper will shortly be undertaken. The smelting business is largely responsible for the increased quantity of coal required by the Republic, the 1903 imports at Taltal, Pisagua and Caleta Buena being: Australian, 92,092 tons; English, 62,937 tons; United States, 4325 tons. The equipment of both new and old mines and metallurgical works which is being extensively taken in hand has led to a large import of mining machinery, especially electrical drills.

## Personal.

W. B. TWITCHELL is superintendent of the Big Lead M. Co. at Ray, Ariz.

ROY U. BISHOP is now manager of the Greenback mine at Greenback, Or.

W. C. ALEXANDER is manager of the Black Diamond mine at Stockton, Utah.

M. G. EVANS is manager of the French Creek M. Co., near Breckenridge, Colo.

F. M. DRESCHER, M. E., has returned to Prescott, Ariz., from Denver, Colo.

R. A. PARKER has returned to Denver, Colo., from a professional visit to Mexico.

E. R. STAFFORD is superintendent of the Arizona Pacific Co. mines at Woolly, Ariz.

F. P. SWINDLER is superintendent of the Bamberger-De Lamar mines at De Lamar, Nev.

H. J. JESSOP is manager of the Cherokee Mexican Proprietary, San Julian, Chihuahua, Mex.

J. W. CARY of Cary & Fielding, Denver, Colo., is in New York City on business connected with his firm.

W. J. HAMMOND, JR., manager of the Treasury T. M. & R. Co., at Ouray, Colo., is visiting in Pittsburg, Pa.

P. C. MCCARTHY, manager Hidden Treasure mine, Lake City, Colo., has returned there from Denver, Colo.

C. MOREHOUSE is manager of the Nueva Australia, Porvenir and Soto mines at Guanacevi, Chihuahua, Mex.

C. RIVES has resigned as superintendent of the Pioche-Nevada M. Co., in Pioche, Nev., and is in Salt Lake City, Utah.

GEO. W. MAYNARD has been investigating a placer proposition at Greaterville, Ariz., and goes thence to Mexico.

R. D. HUNTER, manager Denver branch of the Sullivan Machinery Co., has returned to Denver, Colo., from Chicago.

R. D. SEYMOUR, manager Denver, Colo., branch Trenton Iron Co., has returned there from Salt Lake City, Utah.

A. L. WAYNE is manager of the Manhattan, 6 miles above the head of navigation on Mineral creek, near Coeur d'Alene, Idaho.

C. R. CLAGHORN has been appointed general manager of the coal properties of the N. W. Improvement Co. in Washington and Montana.

H. J. MEISEL, assayer and chemist, and W. T. Taylor, electrician, have resigned their positions with the Rawhide G. M. Co., Jamestown, Cal.

MANAGER R. L. EDWARDS of the Kittie Burton mines at Ulysses, Idaho, has gone to Houghton, Mich., to meet the stockholders of his company.

C. G. DENNIS is superintendent of the Rawhide mine, near Towle, Placer county, Cal. J. Stevens of Nevada City, Cal., has been made foreman.

HERBERT MARTIN of Stockholm, Sweden, is making a tour of the Western mining fields making examinations of large power plant applications.

JOHN H. MACKENZIE returned to San Francisco, Cal., from a professional visit to Nevada, a few days since, and is seriously ill with pneumonia.

R. EAMES, JR., mining engineer for La Fortuna M. Co., Mexico, and Associate Security Co. of New York, has returned to New York from the mines in Mexico.

J. A. CAMPBELL, treasurer of the Cananea Con. Copper Co., has returned from a visit to Los Angeles, Cal., where he has been recuperating from a spell of sickness.

ALGERNON DEL MAR is instructor in mine engineering and assaying at the Pacific Technical College of Oakland, Cal., and is also continuing his professional work.

CARY W. THOMPSON, who has been for six years manager of the Greenback mine at Greenback, Or., retires, and will make mine examination his specialty at Portland, Or.

N. D. PHELPS, formerly manager of the mining department of the Union Iron Works, San Francisco, Cal., has resigned to take the Spokane, Wash., agency of the Allis-Chalmers Co.

L. S. WOOD, for the past two years manager of the Ashanti Goldfields Corporation, Ltd., Obuassi, via Gold Coast Colony, West Africa, has resigned his position and returned to Denver, Colo.

M. K. RODGERS of the Daly Reduction Co. of Montana, and operating the Nickel Plate mines, Hedley, B. C., is now in Ashcroft, B. C., arranging for opening up the Maggie group of mineral claims on the Bonaparte river.

HORACE F. BROWN, E. M., has returned to San Francisco, Cal., from a visit of several months in Pittsburg,

Pa., where he has been conducting a series of experiments on the agglutination of dust from iron furnaces and ores, in his type of furnace, and reports the results highly satisfactory.

## Commercial Paragraphs.

DR. F. J. CRANE, 29 West Alameda Ave., Denver, Colo., is the owner of the Crane patent ore washer, now in use at Cripple Creek, Colo.

F. W. PERRY is now Western representative Niles-Bement-Pond Co. of 136-138 Liberty St., N. Y., with headquarters at 1711 Tremont St., Denver, Colo.

THE Vulcan Iron Works Co., Toledo, O., are sending out a handsome calendar for 1905, in color work, showing their steam shovels, operating under different conditions.

THE U. S. M. Co. have given the contract to equip the new Mammoth smelter, Shasta county, Cal., to the Westinghouse E. & L. Co. The Minneapolis S. & M. Co. have the contract for the structural work.

THE Cedar Hill Coal & Coke Co., with headquarters at Denver, have installed an Ottumwa box car loader at their Tobasco, Colo., mine. This mine is being equipped with up-to-date machinery, and promises to be a paying proposition.

THE Tallerdar Manufacturing Co. of Dolgeville, Cal., have produced a device for laying slip joint pipe without driving. It is claimed by the manufacturers that the pipe can thus be laid faster, and that it saves battering the ends of the pipe.

THE S. H. Supply Co., Denver, Colo., report sales of a 50-ton concentrating plant to Oregon; 100-ton concentrating plant using Bartlett tables to Old Mexico; 25-ton concentrating plant to Idaho Springs, Colo., and a 6-drill compressor and boilers to Montana.

THE Mine & Smelter Supply Co. of Denver, Colo., with branch houses in Salt Lake City, Utah, El Paso, Tex., and City of Mexico, Mexico, report the removal of their New York office from 139 Liberty St. to 42 Broadway. W. C. Hendrie is in charge of the New York office.

THE Chicago House Wrecking Co., W. Thirty-fifth and Iron Sts., Chicago, have made another big buy—this time no less than the buildings at the World's Fair, St. Louis. They will have an immense amount of good material to dispose of, and will doubtless share their bargain prices with their customers.

THE Rand Drill Co.'s agents in Colorado and other Western States, Cary & Fielding, 1711 Tremont St., Denver, Colo., report the sale of seventeen Rand compressors during the past six months. Cary & Fielding also represent the Power & Mining Machinery Co. of Cudahy, Wis., on their line of machinery.

H. H. WILLIAMS, formerly with the Brooklyn Rapid Transit Co., has been elected president of the Lake Shore Engine Works, Marquette, Mich. Mr. Williams is an experienced electrical engineer, and will push the manufacture of their electrically driven machinery in connection with their regular line of mining machinery.

THE Old Dominion C. M. & S. Co., Globe, Ariz., have placed with Borden & Selleck Co., Chicago, Ill., an order for forty-six hopper style Howe standard suspension scales and weigh baskets, also an order with the same company for two rubber belt conveyors. Borden & Selleck Co. are the general Western agents for the Howe Scale Co. of Rutland, Vt., also engineers and manufacturers of conveying and elevating machinery for every kind of material.

THE World's Fair judges awarded the F. W. Braun Co. of Los Angeles, Cal., gold medals for their exhibit of apparatus and appliances for assayers, metallurgists and chemists. Their exhibit was arranged in three groups, and F. W. Braun Co. advise that the highest award, a gold medal, was secured for each group. Among the medal winners were the following: Cary hydrocarbon burner, marvel crude oil burner, Braun gas burner, Cary furnaces, Braun cupel machine and Braun ore sampler.

COLORADO IRON WORKS Co. of Denver, Colo., report the following orders: Eight (100 cubic feet capacity) ore cars for the Cananea Con. Copper Co. in Mexico; six (17 feet diameter) Hendryx agitators for the Liberty Bell M. & M. Co. in Colorado; one set of 40x16-inch improved standard, wide faced, and two sets of 30x10-inch improved standard, narrow faced, fine crushing rolls for the El Cobre M. Co. in Cuba; also six single three-compartment Colorado Iron Works jigs for the same company; four Colorado Iron Works impact screens for the Cripple Creek-Homestake M. & L. Co., and a shipment of ore cars, etc., to the London M. Co., both in Colorado.

THE Allis-Chalmers Co. opened new sales offices in Philadelphia on January 1st in the Land Title Building. The offices heretofore maintained by the electrical department of the company, the Bullock Electric Manufacturing Co., in the North American Building, have been removed also to the Land Title Building, where they have been consolidated with those of the parent company. The new offices are under the charge of W. A. Wood. These interests include the power, electrical, pumping engine, hydraulic, saw mill machinery, flour mill machinery, and other departments which produce rock crushing machinery, cement making machinery, wood preserving machines and plants, mine hoists and machinery for mining and recovering gold, silver, copper and other metals.

## Dividends.

Bunker Hill & Sullivan M. & C. Co., dividend No. 87, \$75,000, payable Jan. 4; total paid to date, \$2,346,000.

## Books Received.

"Coal Deposits of Georgia," by S. W. McCallie, gives a logical account of the geology, topography and coal deposits in Walker, Chattooga and Dade counties. The illustrations are good, and, as a whole, the appearance of the book could well be studied by some of the other State geological surveys.

One traveling through the mining communities of our country cannot fail to be impressed with the great amount of disease prevalent wherever a number of persons are working together. Usually the region has been healthy before the introduction of artificial conditions by man, but coincident with his advent is great numbers is the entrance of sickness. This is due chiefly to ignorance and carelessness with regard to handling waste material. In the large cities the danger has been realized and is combated by regulations for municipal sanitation. The subject has been reduced to a practical science requiring intelligent study. The second edition of a "Handbook on Sanitation" by G. M. Price is a simple yet complete treatise written to define and regulate the dangers of overcrowding in cities. The subject is introduced by a brief review of principles, followed by a description of practical methods. The book is primarily of value to the sanitary inspector or candidate for that position, as it defines his duties, discusses the evils and gives extracts from Government laws and civil service examinations. But it is also of vital import to every manager interested in an efficient return from his employees, for sick men cannot do good work, and observance of simple precautions with regard to ventilation, water supply and sewage disposal will increase the productive capacity of any community. Practical information on these subjects and on heating and food supply is given in this book in a manner that can be presented only by a man of the ability and practical experience of Dr. Price. The book is published by John Wiley & Sons, 43 East 19th St., New York City, for \$1.50, or will be sent post paid by the MINING AND SCIENTIFIC PRESS on receipt of price.

The growing importance of mining as a science is shown when Caleb Pamely finds 1200 pages necessary for but a single branch of this subject in the fifth edition of "The Colliery Manager's Handbook." This is a comprehensive yet condensed treatise on the laying out and working of collieries. It gives emphatic corroboration of the dependence of mining upon the other engineering sciences, for in preparing himself for the ever-threatening unexpected, the mine manager must be acquainted with the rudiments of geology, chemistry and electrical engineering, the fundamentals of mechanical engineering and surveying, and practical mining in its entirety. For English practice the author gives a complete description. English methods are good, but they are conservative. In criticising the book, the reviewer will not dwell on the presentation, which is logical, so much as he will compare the English methods in contrast to the enterprising new world methods. Every English text on mining bears the unmistakable imprint of Callon. His methods were good, but they have been modified; and when the modern student sees the same illustrations in the latest books as in Callon's first text, he marvels at the lack of originality. The treatment of the subject is purely for British conditions. Much space is devoted to parliamentary acts governing mines in each of the shires. The chapter on geology deals with English occurrences only. The methods used in boring for coal are described in detail, but without reference to numerous labor-saving devices that are used in recent oil-boring practice. In comparing diamond-drill boring with other systems, he states that other methods will not keep the hole true and vertical, while diamond drilling will—a manifest misstatement. Methods of working coal mines are well illustrated by comparatively recent English practice. The chapter on shaft sinking gives a very complete description of special methods for sinking through quicksands by the Kind-Chaudron process, Poetsch freezing process, etc., but is woefully lacking in information about sinking in ordinary ground. Under the subject of surface arrangements, valuable information is given regarding the design and care of steam engines and boilers. Timbering is given but fourteen pages, mostly reproductions from the old classics. Examples of poor practice are recommended as all right; nothing is shown of square timbers. The chapter on mine drainage is very good. The mechanism of many standard types of pumps is ably described and well illustrated. The theory of ventilation is given in detail; practical examples do not receive commensurate attention. Rock and coal drills and coal-cutting machinery are well described in accordance with recent developments. The application of electricity and compressed air is described, but little attention is paid to its generation. The subject of safety lamps is given a detailed study. Despite minor defects, the book accomplishes its purpose. It also emphasizes the need for a similar treatise on metal mining. It is the typical text of the modern professor in mining and will be invaluable in its comprehensiveness as a reference text for colliery managers and students. It is published by D. Van Nostrand & Co., 23 Murray St., New York City, for \$10, and will be sent post paid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Trade Treatises.

Of standard size (6x9 inches), and handsomely put up, Catalogue No. 6 from the Lake Shore Engine Works, Marquette, Mich., illustrates and describes their makes of mining machinery and hoisting engines.



## Latest Market Reports.

SAN FRANCISCO, January 6, 1905.

## METALS.

**SILVER.**—Per oz., Troy: London, 28 $\frac{3}{4}$ d (standard ounce, 925 fine); New York, bar silver, 61 $\frac{1}{2}$ c, refined (1000 fine); San Francisco, 61 $\frac{1}{2}$ c; Mexican dollars, 52c San Francisco, 48c New York.

It is said in Wall street that the recent advance in the market price of silver is due to the unusual demand—which exceeds the present supply. This demand is partially traceable to the war in the Orient and to the increasing trade of the United States with China, as well as a continued and very noticeable absorption of silver by India. As conditions now are, the consumer of bar silver must wait for the producer—a fortunate reversal of what has been the order of things for about fifteen years past.

**COPPER.**—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15.25@15.50; Electrolytic, 1 to 3 casks, \$15.25; Casting, 1 to 3 casks, \$14.87; San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £68 15s spot per ton.

Copper has taken another upward turn and the best price for Lake is now \$15.50. The metal is somewhat higher in London, and if the present conditions prevail 16-cent copper would not be a surprise in the near future. The present quotation, \$15.50, is the highest since January, 1901, when it was 17 cents. Copper has seen many "ups and downs" during the past forty-five years. Within that period, the highest price was 55 cents, in July, 1864, and the lowest that year was 39 cents, in January. In 1873, the highest price was 35 cents and the lowest 21 cents. In January, 1880, the price was 25 cents. It has never reached this figure since, the next highest being 20 $\frac{1}{2}$  cents, in December, 1882, and January, 1883. In January, 1884, it had dropped to 18 $\frac{1}{2}$  cents, and this price has never been reached since. In 1896-97, the highest price was 12 cents, and in January, 1898, it went to 13 $\frac{1}{2}$  cents, and has never been so low since. The lowest price recorded in forty-five years was 9 cents, which was in June, 1894, a little over ten years ago, at which time many copper mines all over the world were closed, and some which continued to work were run at a loss. A study of the fluctuations of the copper market is interesting, as it forms, in a way, a historical record of industrial stagnation or activity; the attempts of large producers to corner the market, and various other manipulations, but it can be truthfully said that the great industry of copper mining has never been on a more firm or prosperous basis than at present, and the condition of the copper market, like that of iron, has become to be looked upon as a reliable index to our industrial activity.

**LEAD.**—New York, \$4.70; Salt Lake City, \$3.50; St. Louis, \$4.12; San Francisco, \$4.50, carload lots; 4 $\frac{1}{2}$ c 1000 to 4000 lbs.; pipe 6 $\frac{1}{2}$ , sheet 7, bar 5 $\frac{1}{2}$ c; pig, \$4.85. London: £13  $\frac{1}{2}$  long ton.

**SPELTER.**—New York, \$6.10; St. Louis, \$6.15; London, £24 17s 6d  $\frac{1}{2}$  ton; San Francisco, ton lots, 6 $\frac{1}{2}$ c; 100-lb. lots, 7c.

**TIN.**—New York, pig, \$29.00 @ 29.15; San Francisco, ton lots, 29c; 500 lbs., 29 $\frac{1}{2}$ c; 200 lbs., 30c; less, 31c; bar tin,  $\frac{1}{2}$  lb., 32 $\frac{1}{2}$ @ 35c. London, £132 spot.

**PLATINUM.**—San Francisco, crude, \$18.50  $\frac{1}{2}$  oz.; New York, ingot, \$19.00  $\frac{1}{2}$  Troy oz. Platinum ware, 75 @ 82c  $\frac{1}{2}$  gram.

**QUICKSILVER.**—New York, \$40.00 @ 41.00, large lots; London, £7 15s San Francisco, local, \$39.00  $\frac{1}{2}$  flask of 75 lbs.; Denver, \$45.00.

**BABBITT METAL.**—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 $\frac{1}{2}$ c; extra, 17 $\frac{1}{2}$ c; genuine, 31 $\frac{1}{2}$ c; Eclipse, 35c.

**SOLDER.**—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100 lb. lots, 16.25c.

**ZINC.**—Metallic, chemically pure,  $\frac{1}{2}$  lb., 50c; dust,  $\frac{1}{2}$  lb., 10c; sulphate,  $\frac{1}{2}$  lb., .04c.

**NICKEL.**—New York, 40@47c  $\frac{1}{2}$  lb.; ton lots, 40@47c.

**ALUMINUM.**—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

## STRUCTURAL MATERIALS.

**IRON.**—Pittsburg, Bessemer pig, \$16.35 @16.60; gray forgo, \$15.85; San Francisco, bar, 3c  $\frac{1}{2}$  lb., 3 $\frac{1}{2}$ c in small quantities.

**STEEL.**—Bessemer billets, Pittsburg, \$21.00; open hearth billets, \$21.00; San Francisco, bar, 7c to 12c  $\frac{1}{2}$  lb.

**WHITE LEAD.**—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6 $\frac{1}{2}$ c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails,  $\frac{1}{2}$ c  $\frac{1}{2}$  lb. above keg price; in 1 and 5-lb tin cans, 100 lbs. per case,  $\frac{1}{2}$ c. per lb. above keg price. Dry Lead—In bbls., 1 ton and over, 6 $\frac{1}{2}$ c; do. in kegs, 7c.

**LUMBER.**—(Retail): Pine, ordinary sizes, \$24.00@25.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50 @5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00 @35.00.

**NAILS.**—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4 and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

**LIME.**—Santa Cruz, \$1.25 country, \$1.25 city  $\frac{1}{2}$  bbl.

**CEMENT.**—Imported, \$2.15@2.65  $\frac{1}{2}$  bbl.; California carload lots, \$2.10 f. o. h. at works; small lots, \$2.40  $\frac{1}{2}$  bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

## GENERAL SUPPLIES.

**ANTIMONY.**—New York, Cookson's, 7c; Hallett's, 6 $\frac{1}{2}$ c; San Francisco, 1000-lb. lots, 8c; 300@500-lb., 8 $\frac{1}{2}$ c; 100-lb. lots, 10 $\frac{1}{2}$ c.

**POWDER.**—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 $\frac{1}{2}$ c; less than one ton, 17 $\frac{1}{2}$ c. No. 1\*, 60%, carload lots, 13 $\frac{1}{2}$ c; less than one ton, 15 $\frac{1}{2}$ c. No. 1\*\* 50%, carload lots, 11 $\frac{1}{2}$ c; less than one ton, 13 $\frac{1}{2}$ c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9 $\frac{1}{2}$ c; less than one ton, 11 $\frac{1}{2}$ c. No. 2\*\* 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50 @7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

**FUSE.**—Triple tape, \$4.00 per 1000 feet, double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 feet and up.

**CANDLES.**—Granite 6s, 16 oz., 40s., 11c  $\frac{1}{2}$  set; 14 oz., 40s., 9 $\frac{1}{2}$ c.

**CHEMICALS.**—Cyanide of potassium, 98%-99%, jobbing, 23@24c  $\frac{1}{2}$  lb.; carloads, 23@23 $\frac{1}{2}$ c; in tins, 30c; soda ash, \$2.00  $\frac{1}{2}$  100 lbs.; hyposulphite of soda, 3@3 $\frac{1}{2}$ c per lb.; caustic soda, in drums, 3@3 $\frac{1}{2}$ c  $\frac{1}{2}$  lb.; Cal. s. soda, hbls., \$1.10@1.20  $\frac{1}{2}$  100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6 $\frac{1}{2}$ @7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2 $\frac{1}{2}$ @2 $\frac{1}{2}$ c; powdered sulphur, 2 $\frac{1}{2}$ @2 $\frac{1}{2}$ c; flour sulphur, French, 2 $\frac{1}{2}$ @—c; alum, \$2.00@2.25; California refined, 1 $\frac{1}{2}$ @2c; sulphide of iron, 8c  $\frac{1}{2}$  lb.; copper sulphate, 5 $\frac{1}{2}$ @5 $\frac{1}{2}$ c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1 $\frac{1}{2}$ @2c  $\frac{1}{2}$  lb.; nitric acid, carboys, 8c  $\frac{1}{2}$  lb.

**BORAX.**—Concentrated, 6@7c  $\frac{1}{2}$  lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

**BONE ASH.**—Extra No. 1, 5@6c  $\frac{1}{2}$  lb., No. 1, 4@5c.

**RED LEAD.**—500 lbs. and over at one purchase,  $\frac{1}{2}$  lb., 7c; less than 500 lbs., 7 $\frac{1}{2}$ c. LITHARGE.—Pure, in 25-lb. bags, 8@9c  $\frac{1}{2}$  lb.

**MOLYBDENUM.**—Best, \$2.75  $\frac{1}{2}$  lb.

**CHROMIUM.**—90% and over,  $\frac{1}{2}$  lb., 80c.

**PHOSPHORUS.**—American,  $\frac{1}{2}$  lb., 70c.

**SILVER.**—Chloride,  $\frac{1}{2}$  oz., 90c@1.00; nitrate, 55c.

**MAGNESIUM.**—Pure, N. Y., 60c.

**MANGANESE.**— $\frac{1}{2}$  lb., \$2.75.

**SODIUM.**—Metal,  $\frac{1}{2}$  lb., 50c.

**BISMUTH.**—Suhnitrate,  $\frac{1}{2}$  lb., \$2.10.

**URANIUM.**—Oxide,  $\frac{1}{2}$  lb., \$3.50.

**MERCURY.**—Bichloride,  $\frac{1}{2}$  lb., 77c.

**FIRE BRICK.**—Domestic, carloads per 1000, f. o. h., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

**FIRE CLAY.**—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. h., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market St., S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING DECEMBER 27, 1904.  
778,817.—PICTURE EXHIBITOR—I. Anderson, Prescott, Ariz.  
778,818.—GOLD SAVING APPARATUS—I. Anderson, Prescott, Ariz.  
778,210.—CLOSED END TUBES—Anderson & Argall, San Jose, Cal.  
778,628.—BATH HOUSE—J. C. & E. H. Booker, Pasadena, Cal.  
778,301.—BIN—M. S. Burdick, Alameda, Cal.  
778,413.—OIL BURNER—C. F. Capell, Los Angeles, Cal.  
778,633.—PAY ROLL—C. T. Chichester, Placerville, Cal.  
778,741.—STAMP AFFIXER—J. P. & S. Farmer, Portland, Or.  
778,833.—DOOR SECURER—C. F. Fay, Seattle, Wash.  
778,234.—NOSE GUARD—W. D. Pennimore, S. F.  
778,777.—ANIMAL TRAP—J. W. Gates, Los Angeles, Cal.  
778,577.—OIL BURNER—J. L. Hague, Los Angeles, Cal.  
778,312.—SASH LOCK—W. L. Hall, Spokane, Wash.  
778,781.—FUEL—G. W. Herbelin, S. F.  
778,668.—PAPER ROLL PRINTING—G. D. Horton, Snohomish, Wash.  
778,666.—CONDUIT—A. J. Hoskins, S. F.  
778,682.—WHIP SOCKET—G. E. Kroning, Porterville, Cal.  
778,419.—SLIDE VALVE—H. C. Lenderman, Portland, Or.  
778,325.—IRRIGATING APPARATUS—J. H. Martin, Riverside, Cal.  
778,793.—TROLLEY WHEEL—E. J. McDonald, Los Angeles, Cal.  
778,790.—CALCULATOR—A. H. Merrill, Compton, Cal.  
778,762.—GARMENT PRESS—W. T. O'Brien, Portland, Or.  
778,547.—SEPARATING METALS—L. E. Porter, Camp Rochester, Cal.  
778,550.—ELEVATOR LOCK—R. J. Roulo, Los Angeles, Cal.  
778,551.—ELEVATOR LOCK—R. J. Roulo, Los Angeles, Cal.  
778,462.—PAPER FOLDER—A. E. Sexton, Los Angeles, Cal.  
778,468.—BOX NAILING MACHINE—D. Snitjer, Cupertino, Cal.  
778,813.—ROLL PAPER PRINTING—F. L. Taylor, Oakland, Cal.  
778,521.—PICTURE MATS—F. B. Wheat, Los Angeles, Cal.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

ROLL PAPER PRINTING ATTACHMENT.—No. 778,813. Dec. 27, 1904. F. L. Taylor, Oakland, Cal., assigned to Acme Automatic Advertising Co., a corporation of California. The object of this invention is to provide a compact, simple, adjustable device which may be readily made to print or not, as desired. It consists of a roll paper printing attachment, comprising clamp members, arms pivotally connected therewith, said arms being bent intermediate of their ends and having a projecting part re-entering the angle included by so bending the arm, a printing roller journaled in said arms proximate to the angles thereof, an ink roller supported on said re-entrant portions of said arms and a distributing roller associated with said ink roller.

DEVICES FOR FORMING AND SIZING CLOSED END TUBES.—No. 778,210. Dec. 24, 1904. W. C. Anderson and F. L. Argall, San Jose, Cal. This invention relates to a machine, which is designed for the formation of hollow cylindrical bodies from disks of ductile metal, such as are especially required in the manufacture of tooth crowns, and for

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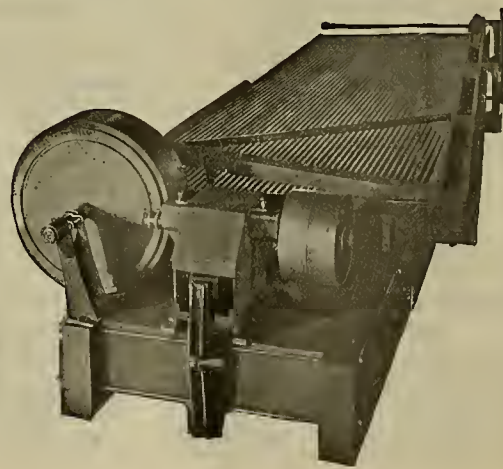
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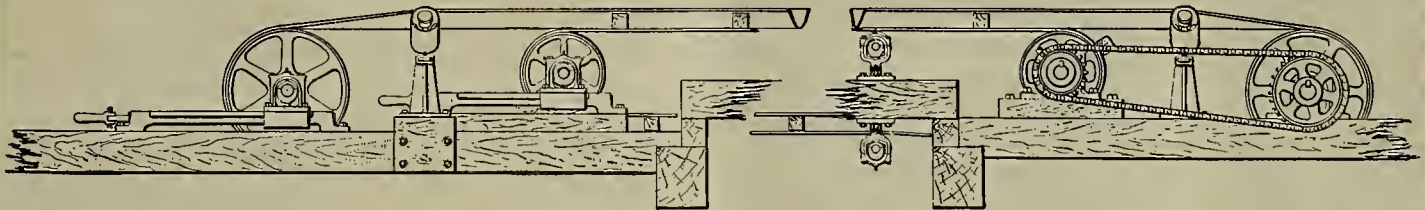


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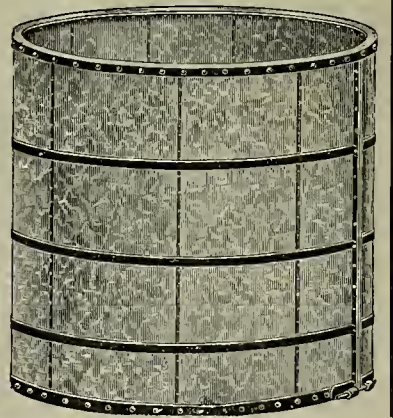
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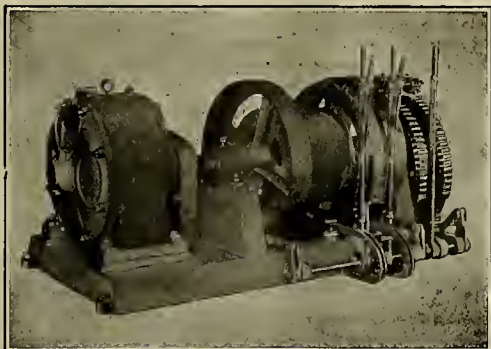
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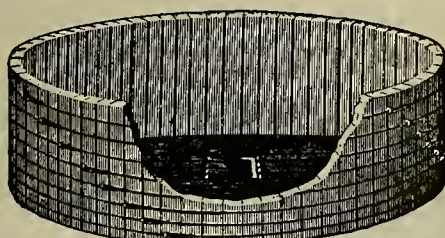
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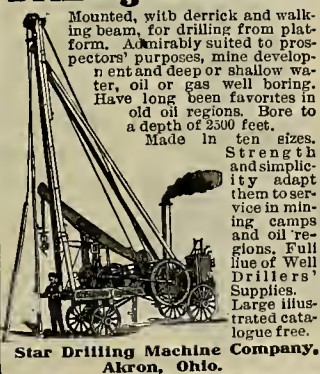
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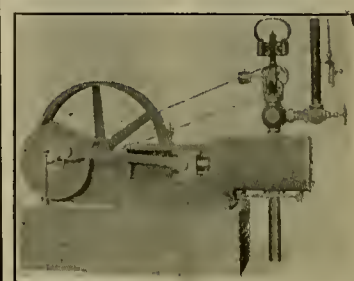
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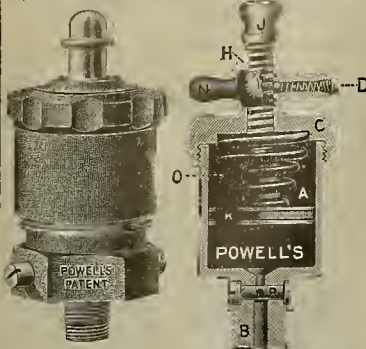
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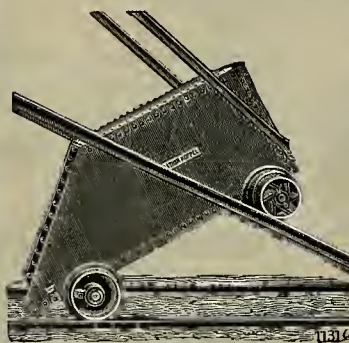


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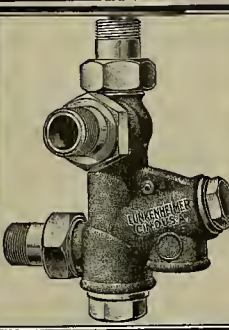
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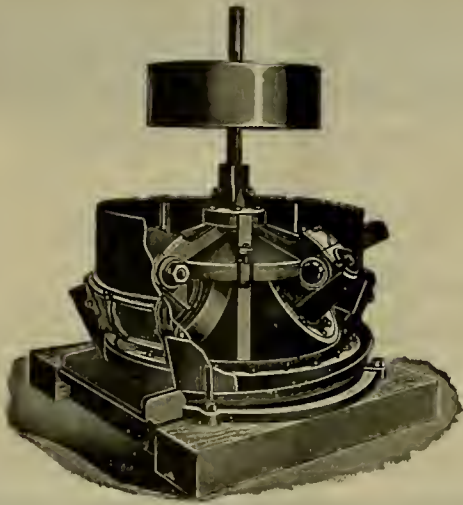
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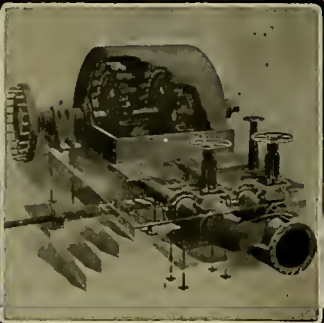
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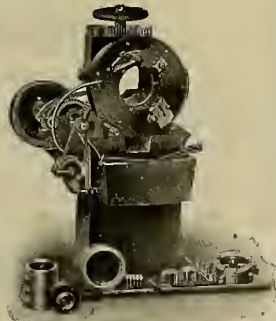
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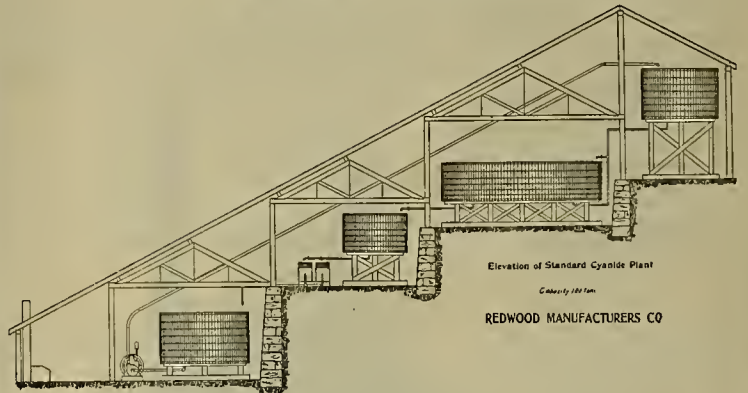
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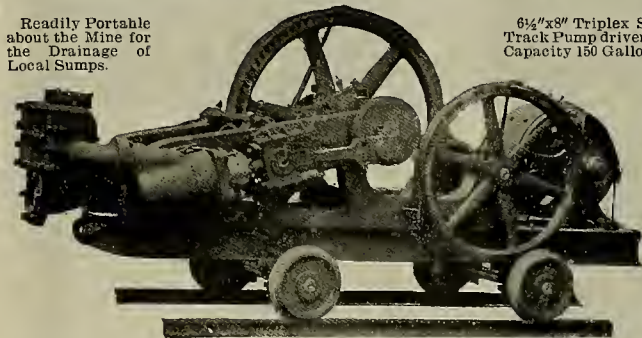
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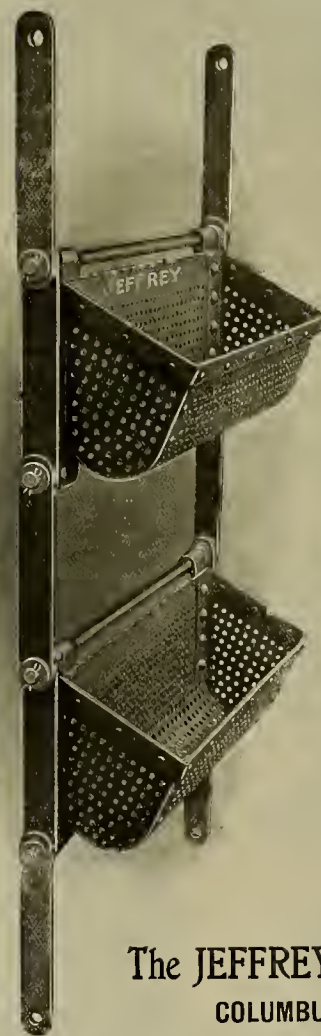
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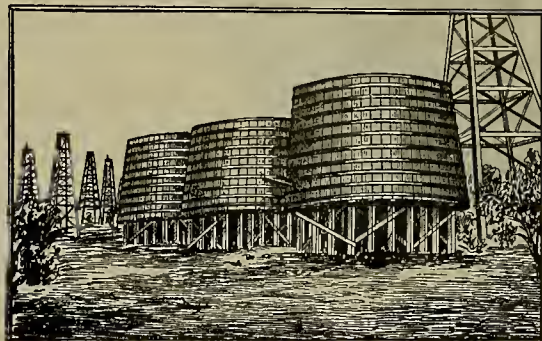
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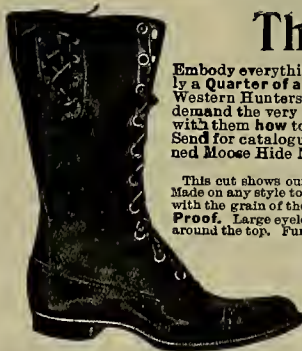


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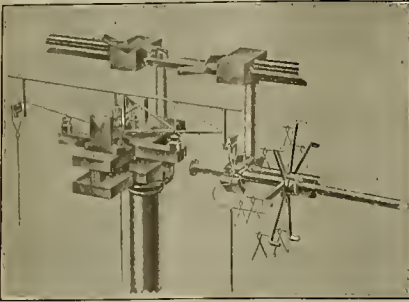
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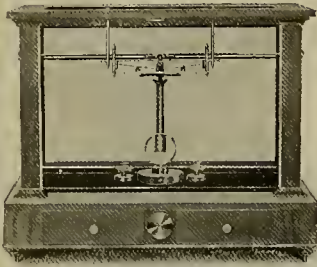
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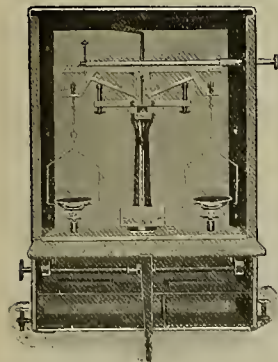
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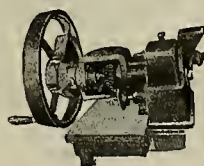
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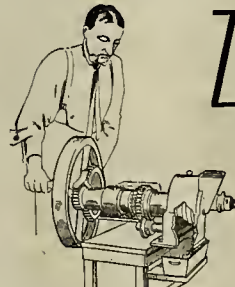
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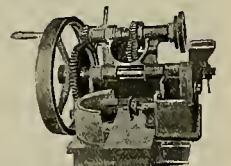
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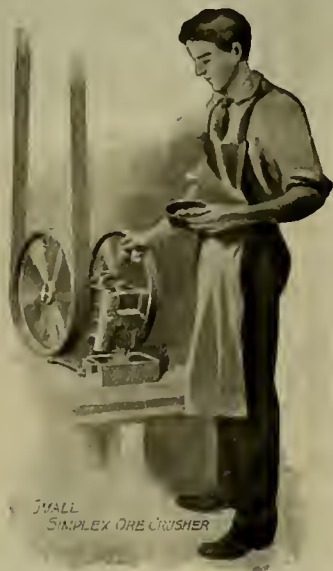
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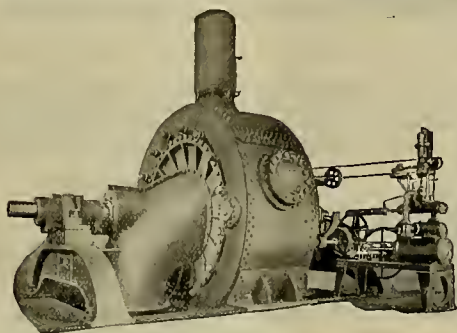
The illustration shows the large NIAGARA design, HORIZONTAL SHAFT TURBINES recently installed by us for the TELLU-  
RIDE POWER TRANSMISSION CO., power station, Logan, Utah. Tests conducted by competent engineers developed as follows:

Head.	Gateage.	Speed.	H. P.	Generator Eff'cy.	Turbine Eff'cy.
211.5 ft. .... 1-2	400 r. p. m. .... 1038	..... 95.20%	..... 73.80%		
209.7 ft. .... 3-4	400 r. p. m. .... 1560	..... 96.50%	..... 83.59%		
208.9 ft. .... Full	400 r. p. m. .... 1677	..... 96.70%	..... 80.57%		

These results have never been equaled by any turbine of the Horizontal Shaft Design, operating under equally HIGH HEADS. The test  
was made AFTER TURBINES WERE INSTALLED, direct coupled to Generators. Francis' weirs and formulae for discharge were  
used. The original test reports on file at our offices. These turbines are all fitted with our SAMSON BALANCED GATES. Note espe-  
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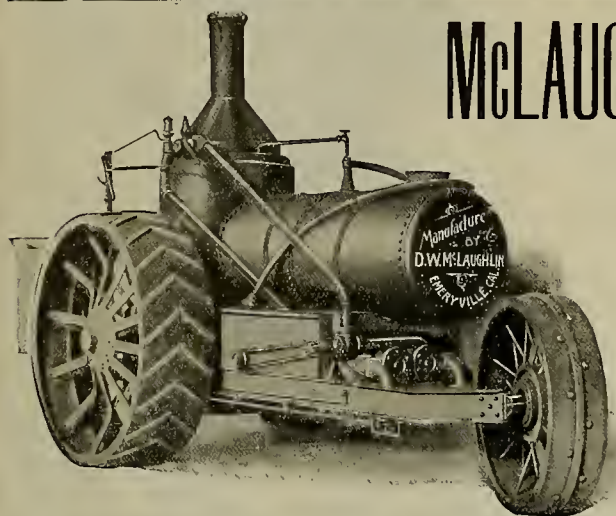
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make them.)



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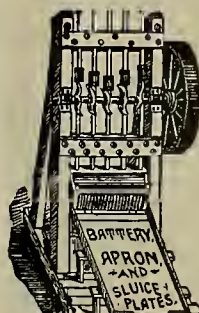
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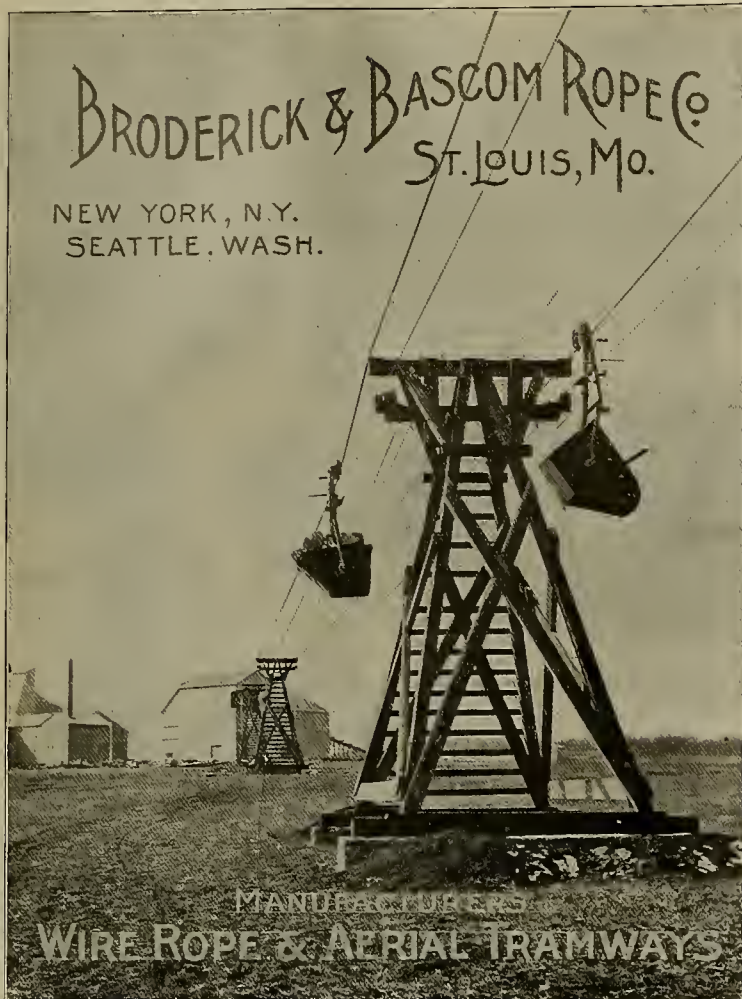
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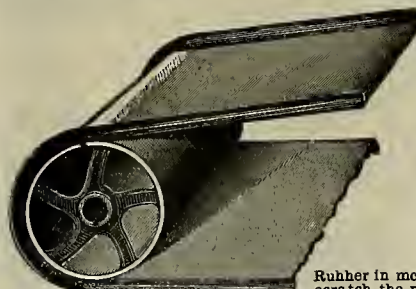
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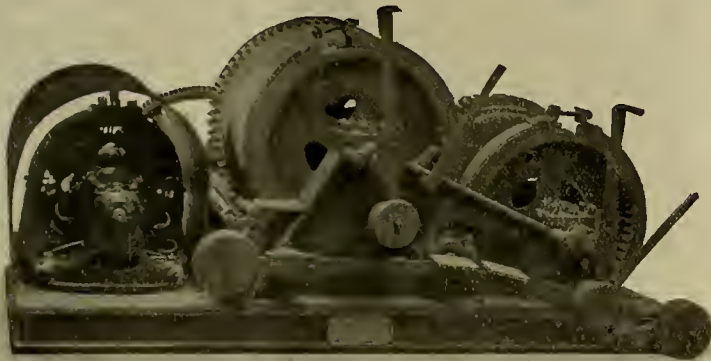
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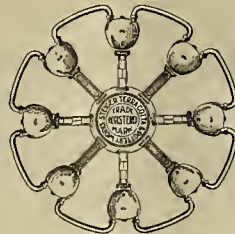
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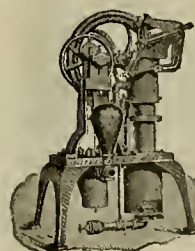
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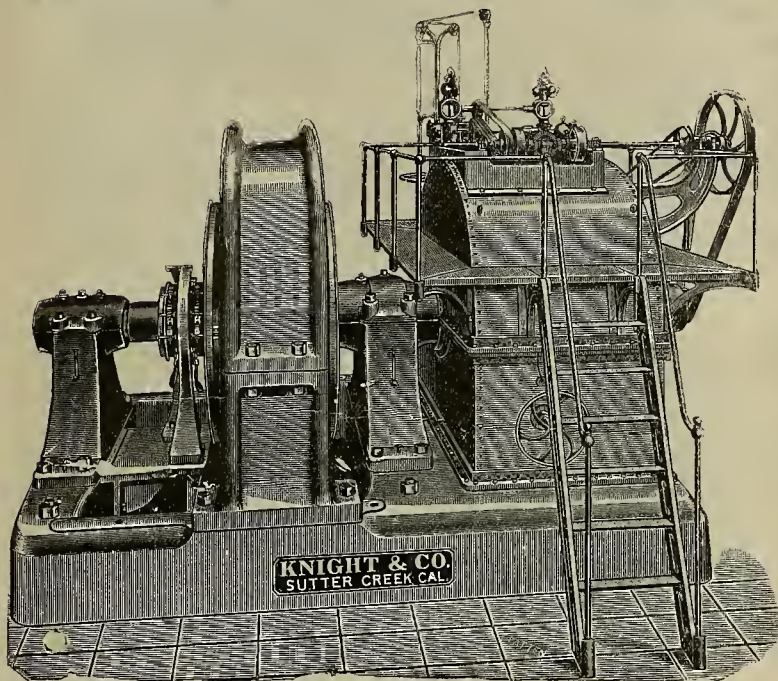
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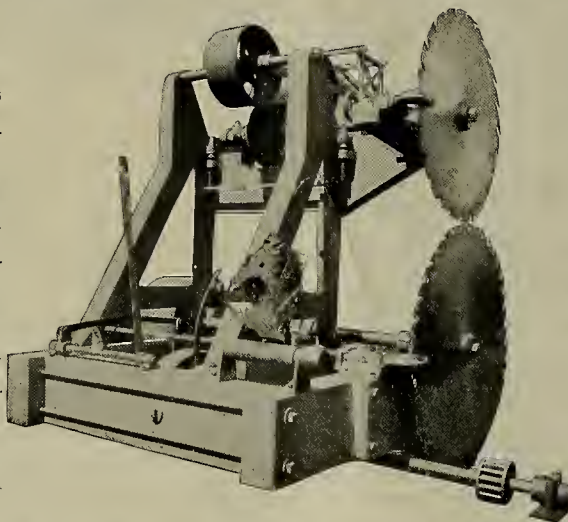
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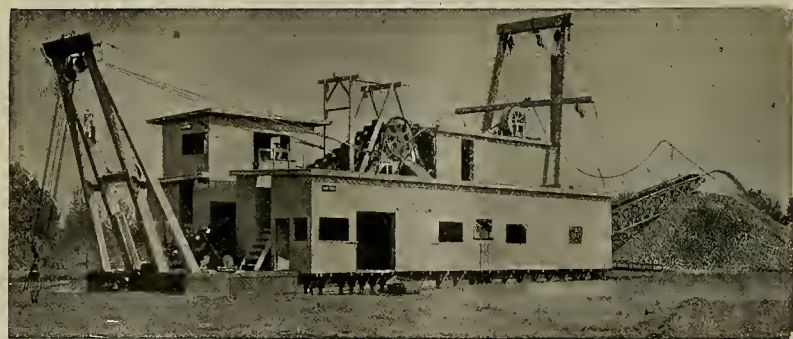
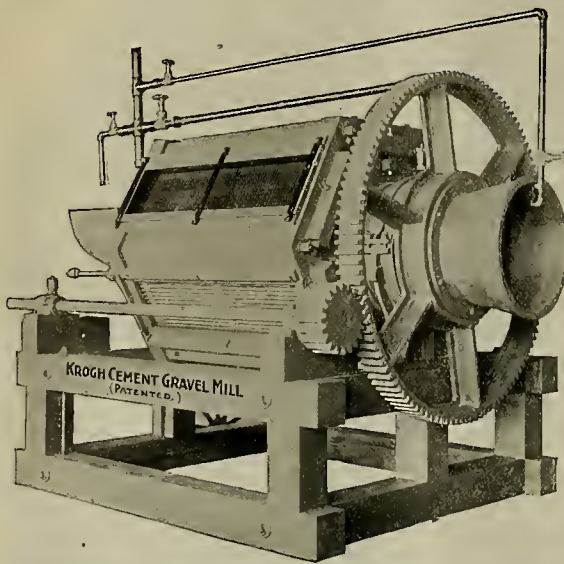
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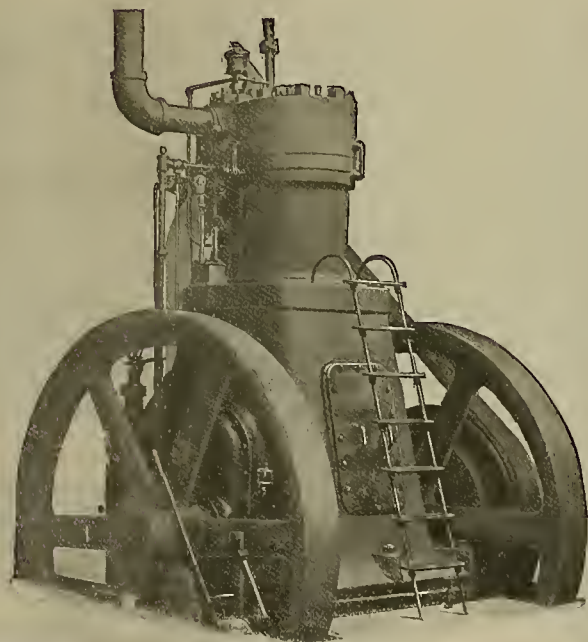
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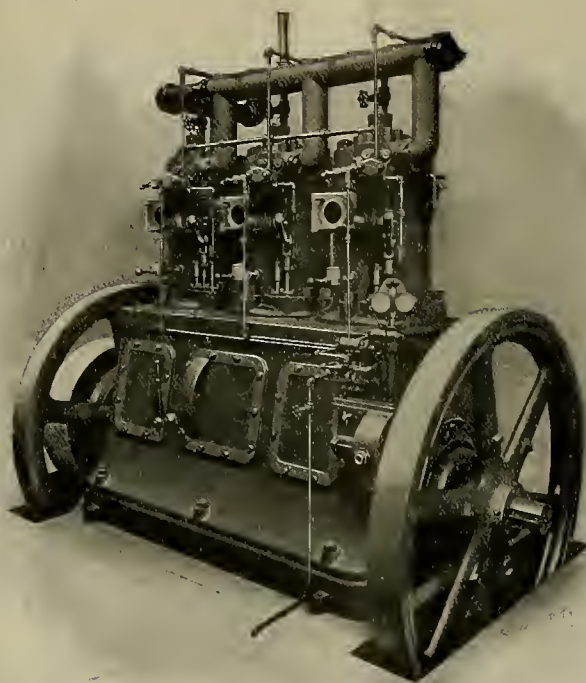


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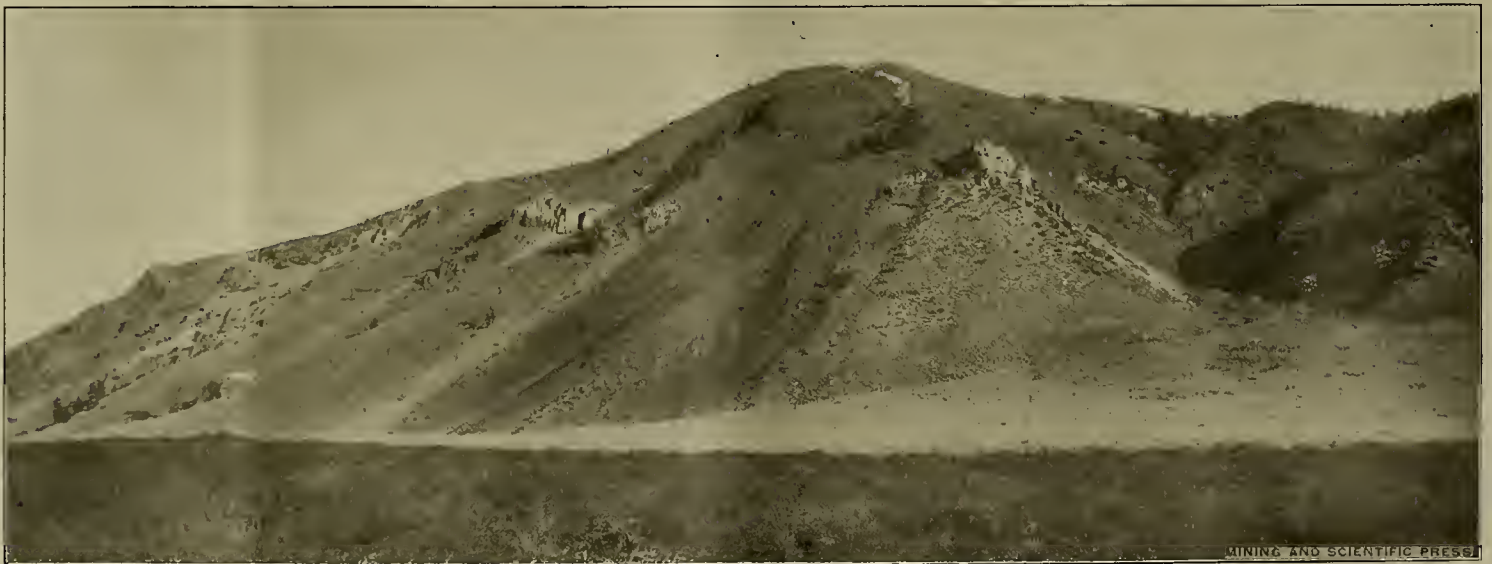
SAN FRANCISCO, CAL., SATURDAY, JANUARY 14, 1905.

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In the Sierra Nevada Near Camp Hassan, Inyo County, Cal.

Showing Glacial Lake and Moraine. A Few Pines are Seen on the Mountain Side While Dense Thickets of Aspen Grow About the Moist Lands Near the Lake.  
(See Page 24.)



The Sister Lode, South from Bishop Park, Inyo County, Cal.

Showing Heavy Talus and Scanty Vegetation at High Altitude in the Sierra Nevada.  
(See Page 24.)



Outcrop of Large Mineral Zone in Sierra Nevada, Near Bishop, Inyo County, Cal.

This Gives a Good Idea of the General Appearance of the Sierra Above 10,000 Feet. (See Page 24.)



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SAN FRANCISCO, JANUARY 14, 1905.

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## Proposed Drainage of Cripple Creek District.

The leading mine owners and operators of the Cripple Creek, Colo., district are earnestly discussing the deep-level drainage tunnel, realizing that only by carrying out the proposed scheme can they hope to mine below the level of the El Paso tunnel. The district is fissured and broken and heavily saturated with water, and the futility of attempting to carry on mining operations below the present artificially created drainage level—the El Paso tunnel—without providing another similar adit at a lower altitude has been fully demonstrated. The cost of the El Paso tunnel was approximately \$35,000, and it is stated by leading mine operators of the district that this tunnel has already saved to the mine owners and operators more than \$500,000. In view of this fact, it is strange that there should be any opposition to the proposed new tunnel, though it is stated that one prominent mine refuses to join in the operation, claiming that this property was in no manner benefited by the El Paso tunnel, and that the proposed tunnel will be of no greater service. It is said to be a fact, however, that the water in the lowest level of the mine in question was lowered several feet by the drainage through the El Paso tunnel. The Mine Owners' Association will meet to-day, and it is hoped will be able to make some arrangement by means of which the work on the new tunnel may be started. In view of the slow progress of drainage of the large area which will ultimately be effected by the proposed tunnel, it is realized that an early beginning is necessary if there is to be no suspension of deep mining in the principal ore-bearing territory of the district. The cost of the El Paso adit, and its relative benefits, to this time, without giving consideration to the long-continued beneficial influence it must have until the drainage is effected by a deeper tunnel, it would seem, should be sufficient to determine every mine owner and operator in the district to do all possible toward the furtherance of so wise and profitable a plan as the construction of the proposed new drainage adit.

## Value of Expert Advice.

One of the much-discussed questions in the mining world is the value of expert and professional advice—presupposing that the advice is based upon sound and experienced judgment.

It is, perhaps, a difficult matter to place an arbitrary valuation upon the services of the advisory or consulting engineer; but for commissions of a limited time—a few days or a few weeks—it should scarcely be figured on a basis of time consumed. The knowledge of the mining engineer is a portion, at least, of his capital, and as such should earn him substantial recompense whenever he has opportunity to invest it. His knowledge has been gained by years of preparatory study and earnest practical application. If his services are sought, it is because his opinions are of value. If the valuation placed on this professional opinion or advice is to be measured by some other standard than that of time, as it properly should, let it be viewed in its relation to the money saved or made for the client. An engineer may be called upon to examine a mine which is without value from a commercial standpoint, and yet possess peculiar elements which readily deceive the inexperienced, who may be induced to invest a large sum of money in its development and equipment. The engineer reports adversely. Are his services of no value because he is unable to make a favorable report? Rather, as he has saved the would-be investors from a disastrous venture, should they be the more willing to pay a handsome fee. In such an instance the engineer is, perhaps, entitled to more than he would be were he able to give a favorable report, for in the latter instance the investors may have made a financial success without either his advice or assistance. There are many going mines operating successfully where the profits could be largely increased had the owners a competent advising engineer.

Often the mine development is not pursued on the best lines—the hoisting and transportation facilities are improperly arranged, and the reduction plant is disadvantageously placed or unsuited to the ore—all of which would be of value to the owners to know. For some reason, often when a proposed investment is discouraged by an engineer, the would-be investors feel somehow as though they would have been better satisfied had they not employed him, and they who are already involved do not always view an adverse report on their enterprise with favor, preferring to pursue the venture at a loss, but with a certain vain hope in their luck. "The laborer is worthy of his hire," and the consulting engineer is very often a most industrious and faithful laborer in the interest of his clients, and his services should be liberally and cheerfully rewarded.

## The Need of Foresight.

Mine superintendents sometimes get credit for being better managers than they actually are. In one instance it became necessary for a company to engage a new man to manage their gold mine, the superintendent in charge, for reasons of his own, desiring to leave. The new man on reaching the mine found things in good shape, a large amount of development work done, and everything in good condition for a prosperous year. He extended the development work, making more ore available, and proceeded to extract the reserves at low cost, and during the year produced a large net result. At the end of the year he resigned and was succeeded by another man, who thought he could do as well as his predecessor, but he neglected to advise the company promptly that the ore reserves were about exhausted. The proper thing would have been for him to close down the mill and proceed with development work as rapidly as possible. This, however, he did not do, but continued stoping and milling at the pace set during the previous year by his predecessor, while at the same time endeavoring to do development work in sufficient amount to increase, or at least keep up, the amount of ore in sight. In his eagerness to follow in the footsteps of the man before him he stoped the ore too close to the shaft and a cave resulted which nearly lost the shaft. At the expiration of his year of hardship and misfortune the second superintendent resigned and was succeeded by his predecessor, who had a sound excuse for clos-

ing down the mill and developing the mine until sufficient ore was in sight to keep the mill steadily employed when it did start up. Here is given an instance of a condition not infrequently seen in the management of a mine, and it exemplifies the necessity of operating a mine in such a manner that it may be capable of making a steady and profitable output, if it has the elements of success within it. Making a spurt in production one year, to be offset by an idle mill and expensive dead work the next, is not the best mining practice, yet it is the clever manipulation of this kind of opportunity that has sometimes made a reputation for success for the one and incompetency for the other.

## Montana's Proposed Mining Law.

Recently the Association of Mining Engineers of Montana, at their annual meeting, took up the question of needed amendments to the local mining laws, and some important suggestions as to Montana's needs in that direction were made. Among other things, it was proposed that the State Mine Inspector should be a graduate of a school of mines of recognized standing; that each of the mines of the State shall annually file with the State Mine Inspector complete maps of their underground workings, and that the stealing of ore should be made a criminal act, and not a mere matter of damages. The matter of drafting suitable bills and of further suggestions was given into the hands of a committee composed of some of the most distinguished engineers in Montana, and, without doubt, the matter will receive earnest and proper attention. In each of the Western mining States, there is no doubt of the need of legislation which would be to the advantage of the industry and to those engaged in it. The business of mining, however, has in many instances, perhaps unfortunately, become so closely identified with stock speculation, that the conduct of mining affairs is often influenced by other considerations than those which are best for the industry at large. There is no doubt that a law, making the stealing or intentional misappropriation of ore a crime punishable with imprisonment, would have a greater effect upon those who are disposed to do so than the mere assessment of monetary damages, but the placing on file of a complete map of underground workings, presumably for public inspection, is such a radical departure from the customary practice that it is extremely doubtful if such a bill can ever become a law in Montana or any other western State. It is interesting to contemplate the placing of such a map in the office of a State officer, where it may be seen by the public the same as other public documents and maps, by a corporation whose annual reports show clearly to how small an extent the stockholders and the public are taken into their confidence. However, it is wholly proper that the societies of mining engineers in the several States should take up and endeavor to bring about legislation which shall prove of benefit to the industry which they represent, and there is certainly abundant opportunity for the exercise of this prerogative.

DURING the summer of 1904, by joint arrangement, several Atlantic States universities leased and worked a mine in Colorado for the express purpose of giving mining students the desired opportunity to do practical work in mining, which is difficult to get in the East. It is along this line that the students of the Colorado School of Mines a few days since took complete charge for a time of the works of an ore testing company at Denver and operated the plant for several days, having an opportunity of going into every detail of ore sampling and testing. As an outcome of the latter experience, it has been determined to equip the Colorado State School at Boulder with a complete sampling and testing plant. Universities and mining schools generally have complete laboratories and small metallurgical plants; but few, if any, of them are equipped upon anything approaching a commercial scale. It does not appear absolutely necessary that such plants be of so extensive design, but the students undoubtedly get a broader idea of his work from an opportunity to see a commercial plant in operation, and is still further benefited if permitted to aid in the work himself.



## CONCENTRATES.

NO. 2 COPPER WIRE is 0.258 inch diameter and weighs 1059 pounds per mile. No. 2 aluminum wire weighs 319 pounds per mile.

THE platinum found in the Grand Encampment district of Wyoming occurs in the copper mineral covellite, a copper sulphide, of rare occurrence.

THIN strips of tin, brass, copper and steel make good shims and should be kept at a convenient place in the engine room of hoist or mill. They are worth a good deal when needed.

CHROMIUM is found usually in combination with iron, and occurs almost exclusively in dark, basic rocks, notably in serpentinite. The chrome-bearing rocks are high in magnesia and low in silica.

MANGANESE is present in nearly all rocks, usually occurring in small fractions of 1%. It is due to the fact, probably, that manganese is frequently found in the superficial exposures of many rocks.

THE tripod is used to some extent in underground work in setting up machine drills, but far less extensively than bars. The use of the tripod seems to be restricted almost wholly to certain districts.

THE limitations of electric power transmission, either as to voltage or distance, have not been reached. What in time these limitations may prove to be can not be even surmised, it being mainly a question of commercial possibility.

SALTPETER is sodium nitrate ( $\text{NaNO}_3$ ). It is this natural salt that is mined in large quantities in southern Peru. It is very similar to potassium nitrate, but is less valuable than the latter. It is employed in the manufacture of nitric acid and in making refined saltpeter.

BARIUM not infrequently occurs in igneous rocks, particularly in rocks high in potash. It is found as a constituent of orthoclase. This fact is probably responsible for the occurrence of heavy spar as the gangue of some veins in orthoclase-bearing rocks, as, for instance, the rhyolites of Calico district, Cal.

IT will probably result in broken cams to give the stamps 113 drops per minute on even a 5-inch drop, as the wear of the shoe and die increases the height of drop, when the falling tappet will strike the cam. It is not usual to give stamps over 110 drops, and generally they do not exceed 100 drops per minute.

THE hyposulphite of soda is employed in leaching the natural chloride ores of silver, as well as those which have been chloridized artificially. Often the extraction of the silver from the ore is much more easy of accomplishment than the subsequent treatment of the silver sulphide precipitate obtained in the process.

IN the construction of a dam it is important to provide means to prevent the water washing out a breach in the top of the dam should the structure be submerged, and also to guard against the water so passing over undermining the base of the dam on the lower or down-stream side. Neglect to look to these matters has resulted in the loss of several dams.

IN making concrete, the material used must be good—clean, firm rock, broken to proper size and screened to remove the fines, dirt and dust, clean, sharp sand and first-class cement. The proportions vary somewhat, from two to four parts sand, and four to ten parts rock to one part of cement. These proportions vary according to the character of the work.

WHAT is known as the Russell process is the treatment of roasted silver ore with a solution of cuprous sulphite:  $2\frac{1}{2}$  parts  $\text{Na}_2\text{S}_2\text{O}_3 + 5\text{H}_2\text{O}$  and 1 part  $\text{CuSO}_4 + 5\text{H}_2\text{O}$ . Silver, silver sulphide and the antimonial and arsenical silver minerals (ruby silver) are soluble in this solution, whereas none of them with the exception of silver are soluble in the hyposulphite of soda solution alone.

BABBITT METAL is generally made of tin 96 parts, antimony 8 parts and copper 4 parts. The idea of the use of babbitt metal in bearings is to use a soft metal which will conform to the shaft revolving in it. Isaac Babbitt, who invented and patented this method of lining journal bearings, did not take out a patent on the alloy. He used an alloy somewhat softer than the babbitt of to-day.

IN securing a hoisting rope to a bucket, skip or cage, it is better to pass the rope around a thimble of proper size, and turn the end of the rope back, securing it by means of three or four stout malleable iron clips, carefully placed. Leaded sockets are sometimes used. Through the thimble pass a safety hook of some good design, which permits the skip or bucket to be quickly removed in case of necessity.

THE Rand was first proclaimed as a gold field in September, 1886. The first milling operations were commenced in the spring of 1887. During that year the output was a little over \$460,000. It rose steadily, reaching \$24,000,000 in 1891, and nearly \$86,000,000 in 1898. The first nine months of 1899 the output was nearly \$80,000,000. The war then began, and production nearly ceased until the close of the war.

IF Portland cement clinker be ground just as it comes from the coolers, without the addition of any retarding substance, the cement will set too quickly to allow of its being properly worked; but if 2% or 3% of gypsum be added to the clinker and ground with it, it will retard the rapid-setting tendency of the cement. In some cases finely ground plaster of Paris is added to the cement after grinding, for the same purpose.

A PIPE LINE when exposed on the surface, whether for conveying water, air, oil or other substance, should be provided with slip joints in a country where there is a wide range of temperature. Neglect to provide these necessary devices may result in the breakage of the line. Air lines are more subject to expansion than lines carrying liquids. Pipe lines laid on steep hillsides should be carefully anchored with iron rods, ropes or chains.

FLAT ROPES are considered by many as superior to round ropes for hoisting, but they are not commonly used to greater depths than 2500 feet. A flat rope has the advantage of having the strands in sight, and greatly increases the opportunities for detecting broken wires or other defects. At some mines it is the weekly practice to thoroughly clean and inspect the ropes, which decreases the likelihood of accidents due to breaking of the rope.

THE Archæan rocks are the oldest known rocks, and antedate the Algonkian. The Archæan is divided into two prominent divisions—Laurentian, the older, and Huronian, the younger period. No distinct organic remains are found in either of these formations. The Algonkian is intermediate of Archæan and Cambrian, is of local occurrence, and is usually difficult of identification where no non-conformity exists with an older formation.

THE average value of manganese produced in the United States in 1903 was about \$8 per ton of 2000 pounds, the price varying with the market for the several States. In California it was about \$11 per ton and in Georgia about \$6. The value of the several varieties of manganese ores, that is, iron-manganese ores, zinc-bearing manganese, etc., varies in the several States the same as for pyrolusite or psilomelane, the most common ores of manganese oxide.

A MINING CLAIM located January 1, 1904, is not subject to relocation until midnight December 31, 1905, if no assessment work has been done up to that time, unless a State or local law requires a stated amount of work as a part of the act of location. The same applies to a claim located any day during 1904. For instance, a claim located December 31, 1904, would require assessment work in 1905, which if not performed within that year would subject the claim to relocation the first day of January, 1906.

SILVER may be extracted from matte by the Augustin process, in which the matte is roasted with salt, forming the silver present into chloride, which may then be leached out by means of hot salt solution, the silver being precipitated on metallic copper. By what is known as the Ziervogel process silver may be recovered from silver-bearing copper mattes by roasting the matte and washing out the silver with hot water in the form of silver sulphate. In this process, like the other, the silver is precipitated on metallic copper.

MANY zones of micaceous schist carry gold, and are generally very free to amalgamate, but when graphitic is present in considerable amount—not an uncommon occurrence—the ore is difficult to treat, owing to the "sickening" effect of the graphite on the globules of mercury. If the ores are stamped and run to settling tanks a great deal of the graphite will float away on the surface of the water, when the pulp may be run through a regrinding mill of some description and amalgamation accomplished without much difficulty.

IT is customary to figure 13 cubic feet for one ton of solid quartz rock in place and 20 cubic feet for one ton of broken rock. This varies somewhat with the character of the ore. Sometimes, particularly in the upper portion of ore deposits, the original ore has been leached, leaving many porous places and vugs. Such rock as this would require more than 13 feet per ton. Ores heavy in iron oxide require somewhat less. Sulphide ores of course require less, the amount being determined by the quantity of sulphide present and its specific gravity.

THE difference in statements as to the amount of broken rock shovellers could handle in a shift's work probably represents the difference in the nature of the material handled. Some kinds of rock break small and are much more easily shoveled than others. The personal equation is also a large one. Some men who can shovel more muck on a shift than any of their companions may not be fitted to do any more skilled work. A man may be an excellent miner and break rock with ex-

cellent judgment, and still not be able to hold his own with a crew of experienced muckers. In some mines the machine men do little or no mucking; in others the machine crew handles their own dirt.

TALC is of several varieties, foliated, occurring in leaves or folia easily separated. It is white, or greenish-white, in color, greasy to the touch and free from impurities. Massive talc, or steatite—also called soapstone—is coarse-grained and of various colors—gray, greenish, roddish, cream colored, etc.—due to the presence of iron oxide and other impurities. It is a very common mineral. In composition it is very close to serpentine, but the latter contains a large amount of water. Talc contains: Silica, 63.5%; magnesia, 31.7%; water, 4.8%. Serpentine has the composition: Silica, 44.1%; manganese, 43%; water, 12.9%. The water is expelled from serpentine at a red heat; from talc only at a high heat.

GOLD, as well as silver, is of frequent occurrence in limestone; in some cases the gold occurs without other mineral, as at the Alvord mine, 23 miles northeast of Daggett, San Bernardino county, Cal., where gold is found in a perfectly white marble, though at no great distance from a body of gold-bearing iron ore. At Oro Grande, Cal., gold was found in pure calcium carbonate in the Carbonate mine, and a similar occurrence was noted at the Marble Point mine, on the main fork of Tuolumne river, near Groveland, Cal. Gold is also distributed through a large mass of crushed limestone in the Black Hawk mountains, in San Bernardino county, Cal., and 5 miles to the northward gold and silver are found in limestone on a mesa known as Silver Reef.

SMALL AUXILIARY HOISTS may be operated at underground stations for sinking winzes, shafts, etc., and may be driven by electricity, steam or compressed air. Steam is objectionable, as it heats the mine workings, and the exhaust has a deteriorating effect on the timbers. There is also a great loss by condensation. As at most mines there is a compressed air plant, air would probably be the most satisfactory, as involving little additional expense. A small hoist which has been used on the surface for prospecting would be suitable for underground use. If it is to be frequently shifted a smaller hoist is preferable to a larger one. Shafts are frequently sunk below the lowest working level by means of auxiliary engines, a bulkhead being placed over a portion of the shaft for safety of men below.

WHEN A's claim crosses B's claim, the latter being the senior location, the right of A to follow his lode or vein across B's location to reach the farther end of his (A's) claim is a question upon which the courts do not fully agree. In Colorado and Montana the junior cross lode claimant (in this case A) has a right to drift through the older claim, following the cross vein, but giving the ore mined to the owner of the senior location. In California and Arizona this right is denied. The matter has never been passed upon by the Supreme Court of the United States, and until such time as it is settled by that court each State will have to settle disputes of this character in accordance with the ideas of the several State courts. The senior locator, however, is owner of all the veins within his claim, whether the outcrop at the surface were previously known or not.

THE cost of tunneling varies greatly, dependent upon the character of material passed through, the amount of timbering necessary, size of cutting and cost and efficiency of labor. It often costs more to complete a tunnel through soft rock than through that which is hard—in some cases the former is double that of the latter. Hard rock though more expensive to break stands well without support, whereas soft rock requires the most substantial kind of timbering and often frequent renewals, where caves occur. This refers more particularly to large than to small tunnels, though tunnels driven for drainage or transportation in mines share to a great extent the same conditions. The cost of driving a tunnel 5x7 feet through hard rock with machine drills is about \$6 to \$7 per foot where wages are \$3 per day. This varies with the manner in which the ground breaks—short or large.

By "rusty gold" is meant gold which is covered by a film of some mineral substance which renders the particles or grains difficult or impossible of amalgamation. It may be that a coating of this description might be impervious to cyanide or other solutions. The substances which coat gold in the manner referred to are iron oxide, manganese oxide and silica. The best way to treat gold thus coated is probably by attrition in a grinding mill of some kind. This brightens the gold and it should then be amenable to some process by which it may be collected and recovered. By mechanical means gold, which is bright and prompt to amalgamate, may be coated with silica so as to resist the attack of mercury. This has been done experimentally by placing nuggets of gold in finely pulverized quartz and subjecting it to heavy pressure. The fine sharp grains of quartz penetrate the outer surface of the gold and firmly adhere to it, completely preventing the contact of the metal with mercury, although the gold may look clean and bright, owing to the transparency and microscopic size of the particles of silica. As suggested above, these may be removed by attrition, though not so well by stamping.



## The Porcupine Placer District, Alaska.\*

Written by CHARLES W. WRIGHT.

The Porcupine gold field, one of the most important placer districts of southeastern Alaska, lies in a rugged mountain belt drained by the Chilkat, a river emptying into Lyun canal. The district embraces an area of about 100 square miles, its central point being approximately in latitude 58° and longitude 136°.

Placer gold was discovered in Porcupine creek in 1893, and developments begun during the following year have continued to the present, with a rapid increase in the output of gold, which aggregates about \$460,000. These placers lie close to the international boundary, and their extensive development has in a measure been dependent on the final settlement of its location.

In 1899 the Geological Survey dispatched an expedition to explore the northern front of the St. Elias range and the headwaters of White and Tanana rivers. This party, under the leadership of W. J. Peters, made its way inland by the Dalton trail, passing close to the then newly discovered gold placers of Porcupine, thus enabling A. H. Brooks, who was attached to the party as geologist, to make a cursory examination of a few of the claims on Porcupine creek.

The growing importance of this district led to a demand for a more systematic examination, and to this investigation the writer was assigned.

**DISCOVERY.**—Placer mining in the Porcupine district dates from the summer of 1898, when locations

expected on Glacier creek, though this has not been sufficiently prospected to determine the local distribution. The gravels of the tributaries entering Klehini river from the north are believed to be of no economic importance.

**CLASSIFICATION OF PLACERS.**—There are three types of gravel deposits in the Porcupine basin—creek gravels, side benches and high benches. The creek gravels fill the present channel to various depths and can not be definitely separated from the side benches or gravel banks which rise in places 20 and 30 feet above the stream. The high gravels occupy portions of former channels, which in some places have been preserved and in others have been cut out by the downward erosion of the streams.

The first of these side bench deposits, at No. 2 below Discovery, is an extensive gravel bed on the east side, 25 feet above the creek. Rich gravels occur at high benches, 80 feet above the creek, on the first three claims above Discovery, and a similar deposit has been found on the south bank of McKinley creek,  $\frac{1}{4}$  mile from its mouth, at an elevation of 200 feet.

**CHARACTER OF GRAVEL.**—The stream and bench gravels consist mainly of a fine wash containing worn slabs and fragments of slate and rounded boulders, often 2 and 3 feet in diameter, mostly of diorite, with some greenstone. In the upper portions of the creeks the gravel wash becomes coarser and more angular. There are no materials in the gravels

progress had been made toward consolidation up to the close of the season of 1903.

**GROUND SLUICING.**—As the best pay dirt is usually at the bottom of the creeks, it is necessary to remove the overlying gravel wash by some economical method. The stream must first be diverted into a flume built up on trestle work or running on one side of the creek. The creek bottom being freed from water, the large boulders are piled along the banks of the stream—those too heavy to move being broken by sledge hammers and powder. A narrow channel built up of boulders is thus formed, which serves to confine the stream and increase its velocity, so that on being turned back into the creek bed it is able to carry off material which it could not otherwise have moved. The miners often enter this swift-flowing stream and, by the use of shovels, help the larger rocks down stream and off the claim. From time to time the water is diverted into the flume, so that the large boulders may be thrown out or broken up. Where the creek bed is wide this temporary channel, continually eating its way downward, must be moved, step by step, from one side of the creek to the other, then perhaps back again in case the gravels are deep. In this way the mass of gravel is disintegrated and washed away and the gold is concentrated in a shallow deposit on bedrock. To clean up the bedrock, sluices are laid, beginning at the lowest point on the claim, and into these the enriched gravels are worked by means of wing dams and shoveling.

As the work progresses up stream additional boxes are supplied.

**HYDRAULICKING.**—In the upper channels, as at the Woodin claim, the gravels have been attacked where the present canyon crosses the former stream bed. The gravel at the mouth was hydraulicked away and sluice boxes laid on bedrock, everything being worked into these sluice boxes by the powerful stream from the hydraulic nozzle. The large boulders are transported to the mouth of the channel by a trolley moving on a cable, which extends the length of the workings.

**MINING BY ELEVATORS.**—Where there is insufficient fall in the creek or where deep pot holes occur, which necessitate a lifting of the gravel, bucket elevators are used. A pit is first sunk to bedrock, into which a sump is excavated, and in this the wash collects, to be elevated to the sluice boxes above. When sufficient space is cleared, a small sluice box placed in the bottom of the pit collects most of the coarse gold.

**SLUICE BOXES.**—The boxes used in the pits are usually 12 feet in length, tapering from a width of 18 inches at the upper end to 14 inches at the lower end, thus allowing them to fit into one another. The larger sluice boxes used above surface are 2 to 3 feet wide and from 50 to 100 feet long.

Riffles of several sorts are in use. An ordinary form is made by fitting round blocks 4 inches thick, sawed from logs 1 foot or more in diameter, into the boxes. Another style consists of poles placed  $\frac{1}{2}$  inch apart lengthwise in the bottom of the sluice box. Still a third sort is made of sawed strips of wood placed crosswise and set at an angle with the bottom of the box, so as to overhang on the up stream side. It is customary to have two or three sets of the pole style at the head of the sluice and below these the block riffles. All of the riffles are held in place by wedges of wood, so that they can be removed for the cleanup which begins with the uppermost set of riffles—the concentrates collecting on the lowest box.

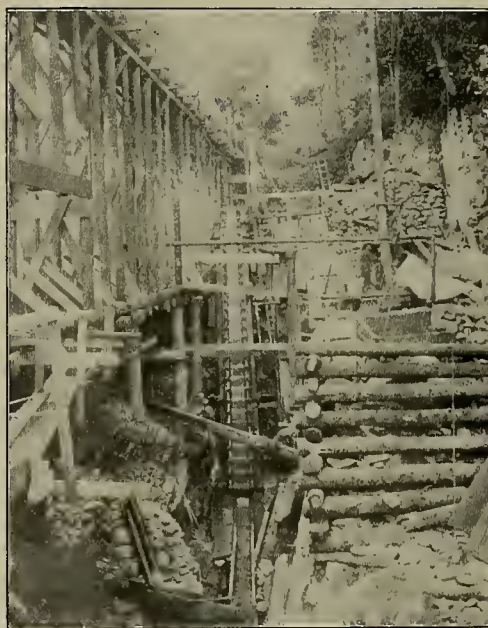
**WATER SUPPLY.**—The flow of water in the different creeks varies with the seasons, and also during the day. Most of it comes from glaciers and snow fields, and on warm, sunny days it is usually one-third less in the morning than in the afternoon. The high water season is usually in the middle of summer, not in the spring, as might be expected on account of the melting of the snow. Low water is during the months of May, June, October and November. In the winter most of the creeks freeze over and are covered with snow, but a small stream continues to flow under the ice. Porcupine creek has a flow varying from 2000 to 5000 miners' inches per minute, and an average fall of 6 feet per hundred, or a total of 2200 feet in 7 miles of its course.

**FORESTS.**—The timber consists chiefly of hemlock, spruce, a few cedars and occasional pines, besides an abundant growth of cottonwood on the river bottoms. The lower hills and mountain slopes are usually wooded to an elevation of 2000 or 2500 feet above sea level. During the winter months the sawmills are supplied with logs not over 2 feet in diameter, mainly of spruce, and in early spring these are sawed and used for buildings, flumes and sluice boxes. A dense undergrowth of weeds, known as "devil's club," and of alders, covering the lower portion of the hills, hinders walking and makes prospecting difficult.

**TRAILS AND TRANSPORTATION.**—The usual route to



Hydraulicking Under the Edge of a Glacier in Alaska.



Bucket Elevator Working in Bedrock Sump.

were made by Mix, Finley and Wiley. They camped near Bowlder creek, and found traces of gold in the stream gravels. Fording the Klehini to Porcupine creek, a mile above Bowlder, they discovered richer gravels and obtained small nuggets of gold. After locating Discovery and the three claims above, which has since proved to contain the richest deposits in the district, they returned to Haines Mission to record their claims and obtain supplies. As a result of these discoveries nearly a thousand prospectors are said to have visited this creek during the autumn of 1898 and the spring of 1899.

**LOCATION OF CLAIMS.**—Creek claims, 1500x600 feet, were staked to the head of the Porcupine and its tributaries, McKinley, Marble and Grizzly creeks, and a number of bench claims were located on the hillsides, some of them several hundred feet above the creek bottom. Other tributaries to Klehini river were prospected and many locations made, though the majority of these have since been abandoned, partly because of their position on the Canadian side of the provisional boundary of 1900.

**PRODUCTION.**—The gold production of the placer diggings on Porcupine creek and its tributaries since their discovery in 1898 has been approximately as follows:

Year.	Value.
1898.....	\$ 1,000
1899.....	9,000
1900.....	50,000
1901.....	110,000
1902.....	140,000
1903.....	150,000
Total.....	\$460,000

**DISTRIBUTION OF AURIFEROUS GRAVELS.**—The distribution of the deposits actually producing gold is confined to the creeks which crosscut the areas of mineralized slates, and the neighboring valleys contain no valuable amounts of gold. The auriferous gravels on the Porcupine extend to the junction of McKinley creek and up this tributary for a distance of 1 mile. Gold is limited to the lower claims on Nugget creek, and a similar occurrence may be

which could not be derived from the drainage basin in which they occur.

**SOURCE OF PLACER GOLD.**—The gold from Porcupine basin is well worn and flattened, occurring in flakes or small nuggets, but is rarely rough and irregular. Its assay values are reported to vary from \$16.30 on McKinley creek to \$17.20 on the lower portion of Porcupine creek. It is of a bright yellow color, though some of the finer gold on the lower claims has a dull bronzy appearance. Nuggets of an ounce weight are not unusual, and one piece is reported weighing 8 ounces.

It is generally believed by the discoverers and operators that the gold of Porcupine and Nugget creeks has been brought from some distant source. The supposed necessity of this view is urged from the coarseness and worn condition of the nuggets, and from the absence of coarse gold and of no more than small amounts of free metal in any of the local veins. The importance of these facts can not be overlooked in attempting to determine the origin of the gold, but it is difficult to show such outside origin, owing to the limited extent of the deposits.

**METHODS OF MINING.**—On Porcupine creek one finds the primitive methods of recovering gold ordinarily employed in partly developed placer districts. The miners have been obliged to make much out of little. With implements, such as picks, shovels, whipsaws, and canvas hose, which they are able to carry to the place of working, they build ditches, flumes and sluice boxes, and install small hydraulic plants. Under these conditions the richest deposits are sought out and worked, though frequently with little economy. When available pockets have been exhausted work comes to a standstill, claim holders cease developing and do only annual assessment work, with the expectation of eventually selling out to companies who can consolidate interests and mine on an extensive and economical basis. During the last few years, however, several small sawmills have been erected by different parties, large flumes have been built, and hydraulic plants and bucket elevators installed; but equipments are still insufficient and no

\*Bull. 236, U. S. G. Survey.



the district formerly followed from Haines Mission was the Dalton trail, which has its starting point at Pyramid Harbor, on the west side of Chilkat inlet, but this road is only practicable for travelers on horses, because of the difficult fords across Taklin and Salmon rivers. Another trail leads along the east bank of the Chilkat to Wells Post, where the Chilkat is crossed by canoe, and thence along the north bank of Klehini river to opposite Porcupine. This, generally known as Throp's trail, is used during the months of low water in the early spring and autumn. During the summer months it is best to wait for a favorable wind and sail up stream. Native canoeemen are always available, and their services are necessary to those not familiar with the river.

Freight and supplies are generally moved in during the months of winter and early spring, when the snow and frozen condition of the streams greatly facilitate transportation. In the summer Indians are hired to transport the freight in their canoes as far as Wells Post, from which it is carried on wagons by a fairly easy route along the banks of Klehini river to Porcupine.

**CLIMATE.**—No climatic records have been kept of the particular area under discussion. The inhabitants claim that the winters are more severe than in the parts of southeastern Alaska nearer to the open ocean and more directly influenced by the Japan current. Heavy snowfalls begin late in October, and in places accumulations in the gulches do not disappear before the first part of June. The line of perpetual snow is about 5000 feet above the sea, and many of the valleys have small glaciers at their heads. During the summer months, however, the climate is more pleasant than that prevailing along the coast, and the precipitation is considered to be less.

**SUMMARY.**—The gold-bearing gravels in this vicinity are confined to the few creeks and benches within an area of 5 miles in width and 10 miles in length, extending from Nugget creek on the Salmon to the mouth of Porcupine creek on the Klehini. Belts of mineralized slates included in this area are crosscut by the streams, and from these the gold has been derived. The workable deposits vary from 25 feet to several hundred feet in width and are from a few feet to 50 feet or more in depth.

The gold-producing gravels on the Porcupine extend to the junction of McKinley creek and up this tributary for a distance of 1 mile. On Nugget creek the gold is limited to the lower claims.

The creek gravels are the most valuable; from information available they average several dollars to the cubic yard, though in local bonanzas much higher values are obtained. In the bench deposits lower values may be expected. The extensive river beds are known to contain some gold, but are of so low value that dredging would be the only profitable method of working them.

While some of the deposits on the lower claims of the Porcupine have been considerably developed, the greater number remain untouched, and to obtain the greatest yield from them it will be necessary to combine operations and work the various claims under one management by more economical methods than are at present employed.

The accompanying engravings shows mining methods in the district.

## Mineral Resources of the United States in 1903.

The twentieth United States Geological Survey annual report on the mineral resources of the country, containing the statistics for the calendar year 1903, is now available. Besides statistics, considerable descriptive and technical matter, obtained while the statistical canvass was in progress, is presented.

In 1903, for the fourth time, the total value of our mineral production exceeded the enormous sum of \$1,000,000,000. The exact figures for 1903 were \$1,419,721,569, as compared with \$1,260,509,738 in 1902, a gain of 12.63%.

The value of iron ore in 1903 was \$344,350,000; the value of the coal, \$503,724,381. The fuels increased from \$469,078,842 in 1902 to \$634,233,791 in 1903, a gain of \$165,154,949, or 35%. Every variety of fuel increased in value. Anthracite coal showed an increase in value from \$76,173,586 in 1902 to \$152,036,448 in 1903. The average price of anthracite coal per long ton at the mine was \$2.50 as against \$2.35 in 1902, the highest figure obtained up to that time since 1888, as compared with \$2.05 in 1901, with \$1.85 in 1900, and with \$1.80 in 1899.

The gain of \$159,211,831 in the total value of our mineral production is due to the large increase in non-metallic products, the metallic products showing a decrease from \$642,258,584 in 1902 to \$624,318,008 in 1903—a loss of \$17,940,576, and the non-metallic products showing an increase from \$617,251,154 in 1902 to \$794,403,561 in 1903—a gain of \$177,152,407. To these products should be added estimated unspecified products, including building, molding and other sands reported to this office, the rare mineral molybdenum and other mineral products, valued at \$1,000,000, making the total production for 1903 \$1,419,721,569, furnishing a good argument for the creation of a Cabinet Department of Mines and Mining.

## Notes on Crushing of Metalliferous Ores in the Stamp Battery in Africa.

NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by  
F. C. ROBERTS.

It is obvious that the degree of fineness to which the ore has been reduced, when fed to the battery, not only affects the capacity of the mill, but has a very great effect upon the wear and tear of the spare parts. The factors which seem to directly affect the capacity of the mill are as follows: (1) Weight of stamp; (2) height of drop; (3) number of drops per minute; (4) height of discharge; (5) quantity of water; (6) mesh of screen. In Rhodesia, a great variation in the capacity of the stamp mill is recorded, the duty per stamp (1250 pounds) varying from 4.3 tons per day to 5.5 tons per day; indeed, as much as 6.5 tons has been recorded. The only way of accounting for this great diversity is in the nature of the ore being dealt with, or that one or more of the factors enumerated above are dissimilar, so that the records convey little unless accompanied by a statement of the working conditions.

Similarly, in referring to the mesh screen used and the degree of fineness to which the ore is reduced, it is often stated that a mill crushes through a certain mesh screen. It is clear that such a postulation conveys no definite information, unless accompanied by data covering the other factors, for it is quite possible to obtain (at the expense of the tonnage) just as fine a product, by using a 20-mesh screen as with a 28-mesh screen; it is only necessary, in order to obtain these results, to heighten the discharge or reduce the quantity of water, one or both, as will be seen by the perusal of the following figures, which pertain to an experiment, made under actual working conditions:

Tons of Water Used Per Ton of Ore.	Battery Screen Used.	Percentage of Total Tailing Passing a 60-Mesh Screen.
6.0	20 Mesh	74.5%
8.0	28 Mesh	69.4%

In recording experimental work of this nature it would be far more to the point if the statement were made that, after classification, certain percentages passed certain mesh screens.

In Africa, amalgamation does not always begin in the mortar box, although inside amalgamation has its partisans. Where practiced, the chuck blocks are lined with copper plates, and "back" plates are used, fastened to the back of the mortar box. There is a large difference of opinion existing in Africa as to the advisability of "inside" amalgamation. Personally, under the conditions existing in Africa, the writer is not in favor of this practice.

One of the main objections is that gold amalgam does not freely amalgamate, and, by reason of the violent agitation of the coarser particles of ore inside the mortar box, constant scouring is effected (in addition, a minute separation of the mercury is produced, referred to as "flouring"), and the particles of amalgam thus disintegrated are discharged from the mortar box, without being fully recovered on the plates, and even though cyanidation follows, it is not at all likely that these losses are fully recovered, as it is well known that a solution of KCy only feebly attacks mercury. It might also be considered possible that the assay value of the slime might be increased through inside amalgamation.

On the whole, in so far as this country is concerned, it may be said that more effective work can be obtained without "inside" amalgamation, if sufficient plate area be supplied, and the conditions generally are made favorable for plate amalgamation. Where "silver" is used inside the boxes, it is fed periodically, the quantity being determined by the condition of the outside plates.

Before good results can be obtained from the bare copper, it requires to be "set," which process embraces a rigid polishing of the copper, usually obtained with clean sand. The plate then freely absorbs the silver, which in turn attracts the gold particles, the whole being frequently rubbed well into the plate; when the plate refuses to become a further absorbent, it is considered to be "set."

A weak solution of KCy is often used in dressing the plates, the frequency of which process depends upon the condition of the ore, water, etc. In Africa, generally speaking, the plates are dressed four to six times per day of twenty-four hours, each plate requiring from five to seven minutes in the operation.

Judiciously used, a weak solution of KCy answers very well for dressing the plates, but it has been the writer's experience that less cyanide and more muscle would give generally better results.

It is interesting to note the amount of gold that a copper plate will absorb (having a superficial area of 60 square feet by  $\frac{1}{2}$  inch in thickness). After being thoroughly scraped, as much as 70 ounces of gold has been obtained by steaming the plate, which represented about 175 ounces of amalgam. The plate being then further subjected to scaling, assayed 3 pennyweights per ton.

It is not usual to steam the plates unless a final cleanup is being made, or a shortage of gold has occurred during the month and the plate gold is required to bring up the grade, although some millmen

contend that this softening is a periodical necessity, in order to keep the plates in good condition.

When a neutralizing agent is required in the treatment of the sand, lime is often fed into the battery, but the more common practice is to feed ground lime into the launder (automatically) below the mill.

This practice also serves another important purpose, in aiding in the precipitation, first of the fine sand before the "spitzkasten," and secondly, in the rapid precipitation of the slime.

The quantity of lime used, of course, varies with the acidity of the product being dealt with. Where, however, the above consideration is not an important one, and it is used as a precipitant, about twenty-one pounds of lime per ton of ore is used.

It is contended by some millmen that the use of lime has an injurious effect upon the plates and to a certain extent interferes with amalgamation; this inference, however, is somewhat exaggerated. Where the water question is a serious one and it becomes necessary to introduce a return system, as a precipitant alone, the intelligent use of lime is of great value. The only valid objection which the writer has observed, in the use of lime, is a certain amount of coagulation in the water pipes which sometimes gives a little trouble, while by its injudicious use it is possible to so coat the zinc shavings in the precipitation boxes that less surface is offered, producing less activity, which may be followed by indifferent precipitation.

The water question in South Africa is a very important consideration, as running streams are few and it is generally necessary to conserve water from the rains, which last about four months. The rainfall in southern Rhodesia amounts to about 30 inches annually; in and about Johannesburg it amounts to nearer 40 inches annually.

As a general statement it may be said that the consumption of water, including mill, boilers, cyanide plant and domestic requirements, amounts to 300 gallons (English gallons) per stamp per hour, or about seven tons of water per ton of ore crushed, but, in some instances, as much as ten tons per ton of ore is used.

With a modern return water system and favorable local conditions it is possible to return for use as much as 75% of the water.

Mill sampling is rigidly practiced, and varies on different properties only in the number of samples taken. Each truck or skip, as it is delivered to the mill, is sampled; in addition to which feeder samples are taken every hour, these being quartered down and returned daily. Screen and lip samples are also taken every hour.

The horizontal "built-in" retort is largely used in Africa. The amalgam is squeezed in a press, and retorts about 34% gold on the Rand fields, and in Rhodesia varies from 28% to as high as 54% gold.

The consumption of mercury upon one property with which the writer is concerned, measured over a period of twelve months, was at the rate of 12.6 grains per ton of ore crushed, and the mill recovery value of the ore was 11.9 dwts. per ton fine gold.

On a large plant, the gold returned from the mill by-products is of considerable importance, and a conservation of all products from the mill is made. The usual by-products obtained are enumerated below, together with the approximate values:

	Per Ton.
Battery Screens.....	2 to 3 grs.
Copper Plates.....	2 to 3 dwts.
Mill Sweepings.....	2 to 3 ozs.
Slags.....	20 to 30 dwts.
Crucibles.....	4 to 6 ozs.
Black Sands.....	7 to 10 ozs.

Battery chips and old mortar boxes are also subjected to treatment, and a small return is made therefrom.

In dealing with an ore with which the gold is known to be mechanically associated, it is often necessary to crush to a minute degree of fineness in order to obtain a high extraction without the aid of a solvent. To burden the stamp mill with the responsibility of obtaining this end is to sacrifice the tonnage, so that it has been largely urged that beyond a certain point it was more economical to install a cyanide plant and extract the tailing values in this way than to operate the stamp mill at so great a disadvantage. There is, no doubt, a certain amount of merit in this contention, where the operation is carried out without classification of product and no arrangements are made for recrusching.

The economical application of the stamp mill would appear to be contingent upon rapid discharge, which would result in the elimination to a great extent of that imperfection, "recrusching."

The metallurgical considerations to be observed, then, are: (1) Under what conditions the gold occurs; (2) what portions of the ore contain the gold; (3) the percentage of the total which this represents; (4) to what degree of fineness it is necessary to reduce the ore, or portions thereof, to liberate the gold values.

Having made the above determinations, the next considerations are that of economical classification and recrusching of those quantities which are of commercial value, for, beyond a certain point, the stamp mill is, no doubt, an expensive method of reducing ores.

It will be of interest to refer to the following figures, which are given in general support of the idea



of confining metallurgical treatment to amalgamation in free milling ores, and pertain to the value of slimes before and after amalgamation.

Although the treatment of slimes is largely practiced on the Rand fields, the writer is not aware of ever having seen figures showing the amount of gold actually extracted from slimes on the plates. These figures are averages of a series of determinations extending over a long period and on widely different ores.

1. Mill—Value of slimes before plates, 15 pennyweights per ton. Value of slimes after plates, 1.7 pennyweights per ton.

2. Mill—Value of slimes before plates, 4 pennyweights per ton. Value of slimes after plates, 2.25 pennyweights per ton.

It is clear that, at least in case 1, were the slimes not amalgamated it would be necessary to provide for the subsequent treatment of this product. Whether it would be possible to extract these values on the plates, when the slimes were combined with the sands and the conditions of amalgamation were the same, for both products, or whether it would be necessary to provide for the classification of the product before amalgamation and arrange the conditions to suit the product (which is quite likely) is a question worthy of careful investigation.

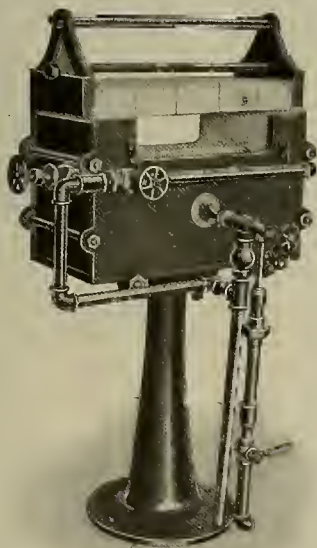
The loss of time in a stamp mill may be ascribed to the following prominent causes: Plate scraping, plate dressing, changing screens, shoes off, boxes choked, broken stem, lacing belts, extraction of steel from boxes.

With the exception of the first two items, it seems almost impossible to overcome the loss of time due to the other causes. With an ordinary grade of ore it is necessary to scrape the plates once in twenty-four hours; and, in most instances, it is usual to dress the plates once every four hours, so that the daily loss of time from these causes may be said to be as follows: Scraping, fifteen minutes per day; dressing, averaging seven minutes each, thirty-five minutes per day.

(TO BE CONTINUED.)

### Ajax Oil Forge.

An extended use of crude oil for fuel has had the effect of bringing out a great many devices for its use, and in the blacksmith shop especially is oil as a fuel appreciated, for the reason that it will give a much cleaner heat for welding than can be obtained



The Ajax Oil Forge.

from the best coal to be had. The forge here shown is especially designed to meet the requirements of mine shops, and for welding steels and sharpening and shanking drills, it has been found to show a saving of from 50% to 75% over coal.

The opening for the work can be reduced to meet any kind of work; as shown it is about 18 inches wide for heating drills, for sharpening with a power-drill sharpening machine, and by the use of both sides of the forge it is possible to heat 200 drills per hour, or enough to keep two drill sharpening machines running. When it is desired to reduce the heating capacity of the forge, all that is necessary is to reduce the opening by filling in with firebrick at each end.

In this forge especial attention has been given to two important features: First, the consumption of all the fuel in the oil. This is accomplished by means of a perforated air pipe under the openings on each side; the air is blown into the opening to confine the flame inside the forge and at the same time furnish sufficient oxygen to permit of the oil being completely consumed inside the forge, with the effect of making it pleasant for the operator to work near the forge, which is the other important feature.

While this forge is designed especially for sharpening, welding and shanking drills at the mines, it is

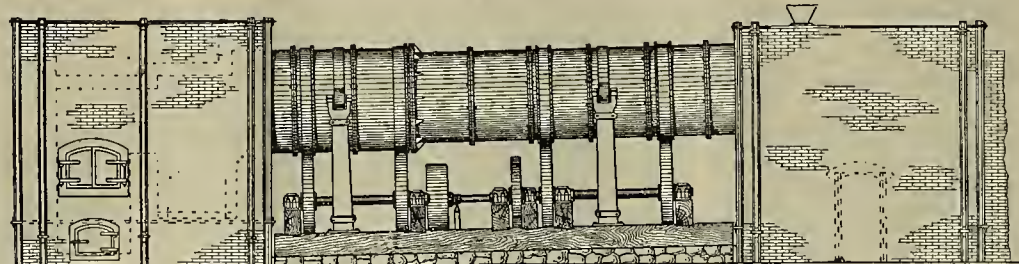
also designed for any and all kinds of general work. Its arrangement will permit of heating bolts, any round iron up to 3 inches in diameter or flat bars up to 18 inches wide, and by reducing the opening, can be used for the smallest work. It takes about five minutes to heat the forge for work at the start, and as it retains its heat through the day, it is ready in an instant. There is no carrying in of coal or carrying out of cinders, and no loss of a heat on account of a dirty fire. The last heat is just as clean as the first. This forge is sold by Harron, Rickard & McCone, 21-23 Fremont street, San Francisco, Cal.

### The Rotary Furnace for Roasting Quicksilver Ores.\*

Written by JOHN W. GEARY.

This article is intended to give some of the leading features of the process of roasting quicksilver ores as carried out at the Socrates quicksilver mine of Sonoma county, Cal.

The furnace in present use is known as the Howell furnace. This is the old Huntington roasting furnace with certain changes to fit the conditions at hand. In general usage it is termed the "rotary roaster." The roasting of quicksilver ores by this method is carried out in no other place in the world, although



White-Howell Rotary Furnace.

the rotary type of furnace has been for many years used for arsenical, pyritical and some zinc ores. But the roasting of quicksilver ores by this type of furnace is yet in the experimental stage, and as experiments of this character require much time and money it will be some years before its true value can be determined.

The furnace is made in the form of a large cylinder 50 feet in length, and with an outside diameter of 5 feet. It is constructed of several shorter cylinders of cast iron, bolted together. It is lined internally with 6 inches of firebrick. The weight of a casting of this size, together with the solid brick lining, is necessarily very great, and demands a strong foundation. The whole cylinder is supported by, and rolls upon, seven large trunnions or wheels. The ends of the furnace fit into sockets or collars which are fastened to the brickwork of the stack and firebox. The furnace is placed on an incline of 6 inches in 50 feet, in order to cause the ore to run through the furnace as it is rotated. The firebox is placed at the lower end of the furnace. It is of brick. The roaster is rotated at twenty-two revolutions per hour. This causes the ore to travel through the furnace and turns it over, exposing all portions to the heated gases passing through the furnace to the stack at the upper end. Power to operate the furnace and to run a large blower at the upper end of the condensers is supplied by a steam engine of 25 H. P.

The preparation of the ore for roasting is very simple, but must be carefully done in order to secure the best results. The ore as it comes from the mine is crushed to  $\frac{3}{4}$ -inch, which has proved to be the most satisfactory size, and thoroughly dried before feeding into the furnace. If the ore is fed in too large pieces the heat will not thoroughly penetrate the lumps; but, on the other hand, too fine ore will pack solid and prevent all particles from being thoroughly heated. However, to some extent this solid packing of the fine ore is prevented by the rotation of the furnace, and on the whole too fine ore is preferable to too coarse. The fines from the grizzly are mixed with an equal amount of coarse rock and run through the furnace.

In order to prevent the moist ore from balling into large lumps, which are baked hard by the heat, it is very necessary that the ore be thoroughly dried before charging. Moist ore also sticks in the feed pipe, and prevents regularity of feeding. As wet ore weighs more than the dried ore, the moisture also causes a very appreciable decrease in the tonnage per day due to this cause alone. The most serious objection, however, is caused by the steam from the moist ore passing into the condensers and thereby interfering with the proper condensation of the quicksilver.

The ore is fed at regular intervals through a hopper placed at the high end of the furnace, next the stack, and by gravitation and the rotary motion of the furnace gradually works its way to the lower end. During its passage through the furnace it is subjected to the heat of gases, which become more

intense toward the lower end. The ore passes in the opposite direction to the furnace gases. The draft, forced by the blower, carries with it the smoke and soot and volatile matter from the ore and fuel, including the mercury. These pass out of the upper end of the furnace into the dust chamber, where the heavier particles settle, and then on into the flues and condensers.

This method of roasting quicksilver ores is entirely different from the common one. In the ordinary quicksilver furnace of the Scott type the fire passes over and under the ore many times before it is finally withdrawn from the furnace. In the rotary furnace but one portion of the ore particles is exposed to the heat at one time, but by the rotary motion of the furnace eventually all portions are exposed, and the effect is the same as in the Scott furnace.

The capacity of the rotary furnace is comparatively small, and depends to a great extent upon the speed with which the furnace revolves. But the ore must not be run through too fast, as this will not give the ore sufficient time for a thorough burning. All ores do not require the same time in the furnace. The period of roasting varies from eight to three hours, the capacity of the furnace being in inverse proportion to the time of roasting required. In furnaces of the Scott type the ore can be left for an indefinite period if desired, and this is an advantage over the rotary furnace. The heat is not as completely utilized as in the Scott furnace. The inside diameter of

the furnace is about 4 feet, and the heated gases pass over the ore into the flue at a high temperature. Thus the heat is not applied where it is wanted, but passes on into the condensers, where it is decidedly harmful.

At present the furnace is running at twenty-two revolutions per hour. This will carry the rock through in about three hours and forty-five minutes. That the ore is thoroughly burned there seems to be no doubt, as the tailings give no trace of quicksilver either by panning or assay. The amount of wood consumed is 1.6 cord in twenty-four hours. This is about the amount required in other quicksilver furnaces, but in addition we have here the expense of considerable machinery which must be kept in repair, an engineer, and of fuel for the boiler.

Quicksilver is a metal which demands strict economic mining and reduction, since at the best the returns are small, and in order to make the business a profitable one it is necessary to figure closely on every expense item.

The condensation in quicksilver vapors after they leave the furnace is carried out in the usual manner.

As regards the success of the Howell furnace for quicksilver roasting, we are not yet prepared to state. It has been in the past, and is now, doing its work very satisfactorily as a roaster, but certain changes must be made before it will be fully adapted to quicksilver roasting, and until it has been given a thorough test for a long period of time it must still be regarded as an experiment.

### A Resurvey of the Cripple Creek District, Colorado.

Although only ten years had elapsed since W. Cross and R. A. F. Penrose, Jr., of the United States Geological Survey, made a careful study of the geology of the Cripple Creek district of Colorado, the people of that State were last year so strongly impressed with the economic importance of a scientific examination of the ground opened by mining operations during that period that they urgently requested a resurvey, agreeing to bear half the expense of the work. The re-examination began accordingly with a thorough revision of the topographic map of Cripple Creek by R. T. Evans, who acted under the supervision of E. M. Douglas. The study of the geology and mines of the district was undertaken jointly by W. Lindgren and F. L. Ransome, assisted by L. C. Graton. The examination begun in June, 1903, and the field work was concluded in April, 1904. Practically every accessible mine in the district was examined in greater or less detail. A preliminary report on the work, prepared by Lindgren and Ransome, has just been published. It is issued in advance of the final laboratory examinations and is a summary of those facts that bear upon the economic development of the region and are of immediate importance to the miners.

At the present time there are about 300 mines in

\*Cal. Jour. Tech.



the district. Many of them are idle and others are consolidated into larger properties. The elevations range from 9000 to nearly 11,000 feet above sea. The district contains two important towns—Cripple Creek, situated on the northwest side of the producing area, and Victor, on the southwest edge of the same area.

The mining methods employed in this district present few features of particular interest. Many large mines are operated by strong companies, but the system of leasing to individuals and small companies with royalty charges of 15% to 25% of the net output remains a conspicuous feature. The mining and milling expenses at Cripple Creek are high compared with those of other localities. Few of the large mines seem to have reduced total expenses below \$16 a ton.

In the course of the present investigation the geology of the district has been entirely remapped upon the carefully revised topographic base. The granites, gneisses and schists have been differentiated and outlined in greater detail than was practicable in the earlier investigation. Some necessary modifications of the earlier report in the way of stronger emphasis on the intimate genetic relationship of the rocks have been indicated.

There is nothing in the history of the district since 1894 which warrants any extension of the bounds of the productive territory as then known. Now, as then, a circle of 3 miles radius described from the summit of Gold Hill would include all deposits of known or prospective value, while the really important mines would be embraced by a circle of half that radius, with its center near the summit of Raven hill. That scattered deposits of greater or less value may be found in outlying portions of the district is by no means improbable, but the close geographic relation of the Cripple Creek ore deposits to the main volcanic center seems by this time well established. A brief review of the mines within this circle is given in this report and mention is also made of the outside mining properties.

At the time of the earlier survey the deepest shafts, those of the Moose, Pharmacist, and Anna Lee mines, were down only about 400 feet, while few of the other mines were over 200 feet in depth. The deepest shaft at present is the Lillie, which is over 1500 feet deep, although Stratton's Independence shaft, 1400 feet deep, has the lowest 'sump' in the district. The American Eagle shaft is nearly as deep as the Lillie, while there are about twenty other shafts over 1000 feet in depth, and at least 100 shafts deeper than the deepest workings of 1894. The amount of drifting and crosscutting accomplished since the earlier survey is more than commensurate with the increased number and depth of the shafts. The district is further intersected in various directions and at different levels by two long tunnels run for drainage purposes and by a dozen or more extensive adits.

The character of Cripple Creek ores, the structural nature of the deposits and the types of auriferous ore bodies found in the district, the depth of the oxidized zone and the relations of ore bodies to depth, the conditions of underground waters in the district, and the subterranean gases found in some of the mines are among the subjects discussed in this interesting report. A final chapter on the future of the district will arrest the attention of many investors.

The statement is made that the ore bodies, known or unknown, occurring below the 1000-foot zone, are probably neither so large nor so abundant as those nearer the surface. The possibility is not denied, however, that some strong fissures between the 1000 and 2000-foot levels may carry pay ore to far greater depths than those yet attained. An increased output may certainly be expected to follow each successful step in deep drainage. It is probable that the production of the district, while exhibiting fluctuations, will on the whole slowly decline. Existing conditions indicate that if the maximum production of \$18,000,000, in 1900, is to be surpassed, the increase will be due to the ore bodies encountered in the upper zone, which is far from being exhausted. This zone still contains much ore, both as parts of known ore shoots and in yet undiscovered ore bodies. It will probably contribute the most important part of the ore mined in the near future.

This report, which is listed as Bulletin No. 254 in the Survey's publications, will be distributed free of charge to those who apply for copies to the Director of the United States Geological Survey, Washington, D. C.

THE mines of the Black Hills of South Dakota produce gold, silver, copper, lead, tin, iron, tungsten and lithia minerals, mica, coal, salt, oil, gypsum, uranium minerals, feldspars, fuller's earth, brick and pottery clays, and abundance and variety of structural materials, such as sandstone, marble, etc. In addition to these, many rare minerals are known to exist in the wonderful hills, but are not mined yet, owing to lack of demand. Within the Hills there is a greater range of geological formation than is known in any other place of equal area and a greater number of ore-bearing geological horizons than are at present known to occur in any other single district.

## The Genesis of the Copper Deposits of Clifton-Morenci, Arizona.\*

NUMBER III.

Written by WALDEMAR LINDGREN.

The following appear to be the successive processes of deposition and alteration of the ore deposits of the district:

1. VEINS.—(Primary Processes.) Pyrite, chalcopyrite, zinc blende, molybdenite (rarely magnetite), sericite, quartz, rarely tremolite, diopside and epidote. Introduction of iron, sulphur, zinc, copper, molybdenum, potassium and silica. Elimination of calcium and sodium.

Processes of Oxidation.—(Action of sulphate solutions without oxygen.) Chalcocite (rarely covellite, chalcopyrite, and bornite), quartz, chalcedony, kaolin, alunite. Introduction of copper. Elimination of zinc, some iron and sulphur.

(Action of directly oxidizing solutions.) Cuprite, native copper, brochantite, malachite, chrysocolla (rarely azurite), chalcantite, limonite, quartz. Introduction of carbon dioxide. Elimination of sulphur, together with some iron and copper.

2. CONTACT DEPOSITS.—(Primary Processes.) Pyrite, magnetite, chalcopyrite, zinc blende, molybdenite, specularite, garnet, epidote, diopside, tremolite, quartz. Introduction of much iron and silica, together with copper, zinc, molybdenum, sulphur, possibly magnesia. Elimination of carbon dioxide and probably some lime.

Processes of Oxidation.—Limonite, malachite, azurite, cuprite, rarely native copper and chalcocite, copper pitch ore, chrysocolla, goslarite, zinc carbonate, willemite, calamine, pyrolusite, quartz, calcite, chlorite, serpentine. Introduction of carbon dioxide and additional copper. Elimination of calcium, sulphur, some zinc and iron.

CHARACTERISTICS OF DEPOSITS.—The important occurrences of deposits of carbonates and oxides in limestone and shale are found in the Longfellow, Manganese Blue, Detroit, Copper Mountain, Montezuma and Shannon mines.

They contain practically all of the oxy-salts of copper known from the district; but chiefly malachite, azurite and cuprite, with very subordinate amounts of native copper and chalcocite. The accompanying minerals consist of limonite, manganese peroxide, kaolin, and soft, yellowish material which, in a large proportion of deposits, generally proves to be decomposing and hydrated forms of tremolite, diopside, garnet, or epidote. Some deposits of chrysocolla and limonite occur, however, in unaltered limestone, and the cuprite-bearing shales are not accompanied by any gangue except a little limonite. The copper minerals are sometimes formed by crustification, but replacements in shale or lime are almost equally common.

The form is sometimes wholly irregular, but there is a marked tendency towards a tabular form following certain strata evidently favorable for deposition. The horizontal extent varies greatly, but rarely exceeds 300 or 400 feet, and the two dimensions are apt to be approximately equal. The thickness ranges from 1 to 30 feet, and is sometimes more. Regular boundaries rarely occur, and the pay ore easily shades off into the country rock. In the Manganese Blue and the Detroit mines several superimposed ore-bearing horizons are found within 300 feet of the surface. The Longfellow deposit has the form of an inverted pyramid.

Acidic porphyry is found in the immediate vicinity of all deposits. Some of them immediately adjoin the contact of the main stock, but others show decided dependence upon dikes of porphyry; one class of deposits forms tabular masses along the contacts of dikes; others, such as the Detroit, the Manganese Blue and the Longfellow, lie between two or three porphyry dikes, the latter being largely barren except for some disseminated chalcocite. Fissures antedating the oxidation, but subsequent to the contact metamorphism, have sometimes influenced the form by guiding the descending waters.

The deposits may be found in any of the Paleozoic horizons between the Coronado quartzite and the Cretaceous beds. They frequently crop at the surface, azurite appearing to resist decomposition quite vigorously.

Driving laterally, or sinking deeper from these ore bodies, is apt to develop hard limestone with typical contact metamorphic minerals and scattered pyritic ores. The very confident conclusion has been drawn that the majority of these deposits have been formed by the oxidation of irregular or tabular masses of low-grade pyritic ores, such as the lower mine-workings have disclosed in such abundance, for instance, in the Yavapai mine.

An enrichment accompanied the oxidation, both on account of reduction in volume and introduction of additional copper as sulphate. The oxidation does not reach the water level, which is far below the present workings, but acts most irregularly, sometimes leaving fresh metamorphic limestone near the surface and again penetrating along fissures to a depth of 400 feet.

The above explanation does not fit all of these

\*Abstract Trans. Am. Inst. Min. Engs.

deposits, for some are unaccompanied by evidence of contact metamorphism and have probably primarily been formed by the action of thermal, vein-forming waters, and others are entirely of secondary origin, being deposited in shales and in the clays along important faults by migrating sulphate solutions. The oxidation of the present ore bodies followed the faulting movement and probably began at a rather early epoch of Tertiary times.

FISSURE VEINS AND RELATED DEPOSITS.—Fissure veins with a northeasterly or northerly trend, but of no great individual length, follow the entire length of the porphyry stock, but are especially developed between Morenci and Metcalf and on Copper King mountain. The most prominent lode system at Morenci extends for about 2 miles, and consists of a number of shorter linked and branching fissures, forming two belts slightly curved towards the south-east. One of them lies in porphyry, within a few hundred feet of the contact, and comprises the principal mines of the district—the West Yankee, the Humboldt and the Copper Mountain. The other and parallel system traverses the metamorphic rocks a few hundred feet southeast of the contact.

Outcrops are very poor, frequently wholly unrecognizable, and it is most difficult to trace the veins on the surface. Low-grade malachite, chrysocolla, and brochantite ores are contained in the outcrops of some veins. Large masses of limonite, while common enough in the oxidized contact metamorphic deposits, do not usually occur in the vein croppings.

Underground exposures always show one or more well-defined walls frequently polished and striated. The faulting movement on these fissures is slight.

In the majority of these deposits there is a central vein which ordinarily is up to 4 feet wide, but may sometimes expand to 50 feet. It is composed of nearly massive sulphides, and closely follows the fissure. In the porphyry this is surrounded by a much wider zone of altered rock, which may constitute ore. The central vein and the altered zone are together characterized as a lode. In almost all of the veins the following vertical distribution of ore is noted:

Surface Zone—From 50 to 200 feet deep from the croppings. Contains oxidized copper minerals or is barren.

Chalcocite Zone—From 100 to 400 feet in vertical extent; possibly more in places. Contains chalcocite and pyrite.

Pyritic Zone—Begins from 200 to 600 feet below the surface. Contains pyrite, chalcopyrite and zinc blende.

It has been shown that the minerals of the upper two zones have been derived from those of the pyritic zone by processes of direct and indirect oxidation; that the chalcocite is wholly formed by replacement of pyrite effected by solution of cupric sulphate; that secondary covellite, chalcopyrite and bornite only occur in very small amounts. Also, that the surface zone is derived from the chalcocite zone by its direct oxidation. It has further been emphasized that the pyritic zone is generally very poor; that the chalcocite zone produces the richest ore, and that the surface zone is always poor and sometimes barren.

The pyritic part of the veins is, with good reason, believed to represent the primary deposition of sulphides along the fissures. It contains a small amount of quartz gangue with intimately intergrown pyrite, zinc blende and chalcopyrite. The two last-named minerals are present only in small quantities; molybdenite also occurs. A well-defined foot wall is usually present, while the hanging wall may be more or less indistinct or represented by several subordinate fissures. The deposition seems to have been chiefly effected by metasomatic replacement of crushed and sheeted porphyry, or metamorphic rock. The zone of altered rock surrounding the vein consists of sericitized and pyritic porphyry when the vein is in this rock, and may then be very wide. In the hard, metamorphic limestone and shale this zone is narrow and shows either an amphibolitic or a sericitic alteration and contains, besides pyrite, chalcopyrite and zinc blende intergrown with magnetite, a mineral absent from the vein proper. In the chalcocite zone, commercially the most important, that mineral has largely, but rarely wholly, replaced the pyrite, both in the massive veins and in the zones of pyritization and sericitization surrounding them at a certain depth. It is generally sharply separated from the pyritic zone, the transition taking place within a surprisingly short distance. Below this limit, evidence of chalcocitization can only be found along fissure planes. The uppermost part of the chalcocite zone is invariably the richest. The massive pyrite veins form pure, dull black chalcocite, or a mixture of pyrite and chalcocite. This constitutes high-grade ore with more than 5% of copper—ranging up to 70%—while the pyritized porphyry turns into low-grade ores with from 2% to 5% of copper.

To these large bodies of low-grade ore the recent great development of the district is due. In some mines the chalcocite begins almost at the surface; these are generally on the lower slopes, or in the bottoms of canyons. At Morenci, situated high up on the hills, the depth from the surface is rarely less than 200 feet. The depth on the vein attained by the chalcocite zone from the level where direct oxidation begins to the upper limit of the pyritic zone varies greatly; it is sometimes less than 100 feet,



while under Copper mountain the average would somewhat exceed 200 feet. Directly below the summit it is 300 feet, and its lower limit in some cases has not yet been reached. In general, the upper limit would be represented by a curved line somewhat less convex than the contours of the mountain. The lower limit seems to be flatter, but great irregularities exist, due no doubt to exceptional conditions of circulation of surface waters.

The great bodies of low-grade ore are almost wholly confined to the lodes of porphyry, and the pay zone generally contracts greatly when contact metamorphic shales or limestones are entered. Slopes of low-grade ore range from a few feet to 100 feet or more in width; many are 200 feet long and have been stoped for the same vertical distance. The great body of concentrating ore between the two Humboldt walls, which dip against each other, is about 500 feet long, up to 200 feet wide, and has been stoped 200 feet high. Values gradually decrease on both sides unless, as sometimes happens, confined by fissures on one or both sides. The limit is thus usually simply determined by the lowest grade of ore workable.

The ore shoots of Copper mountain are thus materially different from those usually found in gold and silver veins. Their greatest extent is horizontal rather than vertical and their size depends more upon conditions of circulation of surface waters than upon the primary distribution of copper in the vein. Prospecting for reserves must proceed laterally rather than seek extreme depth.

The surface zone is always richest near the lowest limit of oxidation where cuprite and native copper form from chalcocite. The upper part contains poorer ores of malachite, brochantite, etc., and may be entirely barren.

In the Copper mountain veins the chalcocite apparently changes directly to cupric sulphate and other copper oxy-salts are practically absent. The pyrite remains, in part, rusty and accompanied by limonite, until near the surface, where it finally disappears. The surface zone is thus directly derived from the chalcocite zone by gradual erosion and oxidation, indicating that the latter is not a very recent development.

Two of the principal faults of the district cut across the Morenci veins and dislocate them. Some of the ore bodies are clearly faulted, so that rich chalcocite ore is brought opposite leached and barren surface rock. Brecciated zones accompanying this faulting contain fragments of chalcocite ore. In all, the evidence is pretty clear that at least a part of the chalcocite zone had already been formed when the faulting took place, and that, consequently, the beginning of chalcocitization and oxidation must be placed in the earlier or middle part of the Tertiary times.

Description of chalcocite ores from other districts state that the secondary sulphides develop to a point just below the water level. In none of the important mines in this district has the water level been reached; it is probably far below the present workings. Chalcocite may now form in the upper part of the zone away from fissures and faults in places, where sulphate solutions are slowly descending and free oxygen scarce, but I doubt very much whether it is now forming in the lower part of that zone. I regard the chalcocite zone as formed about an ancient, gradually receding water level. During the early Quaternary that level was evidently several hundred feet higher than at present, but the occurrences of the chalcocite appear to require a still higher stand, such as existed during the probably moist climate of the middle Tertiary.

The payable deposits, as a rule, lie at high elevations and no large deposits have been opened on the lower slopes of Chase Creek canyon or along its bottom. The lower down on the slope a deposit is located the nearer to the surface will the chalcocite zone be found. Chalcocite ores do occur, in fact, in veins along the bottom of Chase Creek canyon, but the mineral shows only as a slight coating on pyrite.

Chalcocite ores and oxidized ores forming a "stock-work" of seams in porphyry—at Metcalf mines—or in quartzite, as in the East Yankee mine, or occurring as disseminations in porphyry dikes—West Yan-

kie lode and Shannon mine—in general correspond to the descriptions of the altered zones surrounding the veins. They presuppose earlier sericitization and pyritization effected by primary vein-forming solutions.

(TO BE CONTINUED.)

### New Uses for Cement.

A company has recently been formed at Saginaw, Mich., for the construction of works to manufacture shingles of Portland cement, says the Cement Age. The method of manufacture is described as follows:

### Mining in the High Sierra of California.\*

Throughout the world the mines are confined to no particular geological horizon, nor to any definite altitude, but valuable deposits of mineral are found in rocks of all ages, and of almost every kind. In Alaska, the payable ore deposits, at some places, come down to the waters' edge at sea level, and in California and Colorado valuable mines are found at varying altitudes up to over 14,000 feet. In other States, the altitude of the mountains seldom goes



Stone Bridge, With 80-Foot Span, Near Lake Tahoe, Cal.



A County and State Bridge on the Sierra Highway.

The shingles are made of Portland cement over a metal vertebra or reinforcement that terminates in loops at either side for nailing securely, but not rigidly, to resist the action of the elements. They are made  $\frac{1}{2}$  of an inch thick at the butt and slightly tapered. They can be made of any width, shape or color and handled and shipped as slate. They may be used to replace worn-out wooden shingles or slate and are highly ornamental. They compare favorably in price with slate and the best wood shingles.

The process of manufacture is unique. The molds pass on a moving belt. The shingles are placed in a shelf rack for thirty minutes, and then the molds are removed by a single process. The shingles are left in the yards on open racks to mature.

higher than 10,000, but it is demonstrated in both North and South America that mines exist up to altitudes as high as men can work to advantage. In Colorado, most of the mines are at altitudes above 7000 feet and a great many are at 10,000 feet and over, so the high, snowy mountains have no terror for the miners of that State, but in California the greater part of the vein mining is carried on at altitudes between 1000 and 3000 feet, and in many instances the mines are situated in pleasant valleys, surrounded by, or near, fertile farms and meadows. To the California miner of the foothill region, the idea of mining up near the summit of the snow-clad

\*See illustrations front page.



Sierra is abhorrent, notwithstanding their inviting coolness during the hot summer days. Still, there are valuable ore deposits in the high Sierra, some of which have been developed, to a limited extent, in past years and which to-day offer inducements to capital superior to those found in many distant lands.

The great drawback in the development of the mining industry in the Sierra is the lack of inexpensive transportation, but that the topographical difficulties are easily overcome is already demonstrated in many places. Good roads, substantially built, are in existence and it only requires a repetition of the effort heretofore made to extend these highways, or to construct new ones, to reach the various mining districts.

The accompanying engravings illustrate several

in first cost, but usually increases the expense of making subsequent permanent improvements.

The mining districts in the Sierra region of California are somewhat scattered, but are found from Lassen county to Inyo. Some of the most noted are in the Sierra Buttes section, in Sierra county, at Lundy and Tioga in Tuolumne county and at several places southward along the summit of the range. In Inyo county, there are a number of old camps where mining was formerly carried on, when conditions were not as well understood as at present. Among the more recent developments in this region are those of the Bishop Creek company above referred to, in the high ridges about the head of Bishop creek, in the central range of the Sierra Nevada, in Inyo county. Until recently, there was neither road

by the commercial results obtained when equipped with machinery and operated. It is claimed that numerous samples assayed returned from \$1 to \$60 in gold and a little silver, and that the zone, or lode, from which these samples were taken exceeds 300 feet in width. As the development is superficial as yet, it will probably be necessary for large amounts of the ore to be treated in reduction works of proper construction before the average values can be arrived at.

The metallurgical treatment is also a matter remaining to be determined, as is usually the case where the values are almost wholly confined to the sulphides present. As free gold is not claimed to be abundant, except in the superficial portions of the lode, it is probable that concentration and cyaniding will be important factors in the reduction of these ores.

The success of this new enterprise in the high Sierra will doubtless be the signal for renewed activity in that region, and it may be anticipated that when the possibilities of that region are better understood and demonstrated the Sierra region will become the scene of an active, prosperous, and long-enduring industry.

## Water Rights in California.

NUMBER V—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by  
SAMUEL C. WIEL.

LOSS OF RIGHT.—Water rights may, it is true, continue indefinitely; but they may likewise come to an end in several ways; and the chief of these are abandonment, adverse use and eminent domain.

1. Abandonment is a question of intention, to be drawn chiefly from the acts of the owner. If the owners disperse, the mine for which they used the water being worked out, and two years go by without their doing anything, they have abandoned their water right (32 Cal. 26). If they make a parol of it, it is a sign that they have abandoned it; in *Grizesa vs. Terwilliger*, 23 Cal. Dec. 313, it seems to have been considered even to be absolutely an abandonment. But this, it seems to the writer, should be regarded as only a conditional abandonment—that is, one depending on the validity of the attempt to dispose of the water right; and of no effect if the object of the parol sale is not carried out; just as in 106 Cal. 660 at 762, an owner abandoned an old ditch and used the water through a new one which, it turned out, he had built on another man's land without right. This, it was held, gave no right to use the water in the new ditch, but the right to use it in the old ditch was not necessarily lost.

The water must be continually applied to the beneficial purpose for which it was appropriated—a failure to do so is an abandonment (C. C. 1411). Up to five years the failure to use it is not conclusive and may indeed be explained away—it is a question of intention. But after five years it is conclusive. The intention may be drawn from lapse of time alone as well as from affirmative acts of the owner.

"In this State, five years is the period fixed by law for the ripening of an adverse possession into a prescriptive title. Five years is also the period declared by law after which a prescriptive right depending upon enjoyment is lost for non-user; and for analogous reasons we consider it to be a just and proper measure of time for the forfeiture of an appropriator's rights for a failure to use the water for a beneficial purpose.

"Considering the necessity of water in the industrial affairs of this State, it would be a most mischievous perpetuity which would allow one who has made an appropriation of a stream to retain indefinitely, as against other appropriators, a right to the water therein, while failing to apply the same to some useful or beneficial purpose. Though during the suspension of his use other persons might temporarily utilize the water unapplied by him, yet no one could afford to make disposition for the employment of the same, involving labor or expense of any considerable moment, when liable to be deprived of the element at the pleasure of the appropriator and after the lapse of any period of time however great.

"The failure of the plaintiffs to make any beneficial use of the water for a period of more than five years next preceding the commencement of the action, as found by the court, results, from what has been said, in a forfeiture of their rights as appropriators." (Smith vs. Hawkins, 110 Cal. 122 at 127.)

There is an abandonment of whatever runs waste after use. When the owner has made all the use of the water he wants, and lets the waste run off, the waste is abandoned, and the owner no longer has any right to it. If it finds its way by natural channels into another creek, the owners there have a right to it (3 Cal. 249). If he digs a ditch to drain away the water because it interferes with mining the



Heavy Retaining Wall on State Highway in the Sierra Nevada.

phases of road building in the high Sierra. One illustrates the result of private enterprise, near Camp Hassau, in Inyo county, Cal. Here a temporary bridge of logs and rock has been quickly constructed, at small cost, over a mountain stream, to facilitate the development of the mines of the Bishop Creek Con. G. M. Co. The other engravings show a wooden-truss bridge, built by the county authorities of El

nor trail in this portion of the Sierra, and these conditions ordinarily form a sufficient handicap to prospecting, unless some remarkable discovery be made, which attracts attention to the vicinity. The mines have been taken up near the North and Middle forks of Bishop creek, from 16 to 20 miles southwest of the village of Bishop, with which they are now connected by wagon road. The lode upon which



Bridge Construction in the Sierra Nevada, Near Camp Hassau, on Bishop Creek, Inyo County, Cal.

Dorado county, on the Lake Tahoe road, by its side is the handsome stone structure in course of construction by the State. The engravings show the false work beneath the 80-foot stone arch, which will be removed as soon as the work has advanced sufficiently to justify it. A fourth illustration is that of a road graded around a jutting spur of the mountain, the lower side being sustained by a substantial retaining wall of dry rubble. Several miles of this kind of work have been done on the Lake Tahoe road, and the same kind of work may be accomplished in almost any locality where it becomes necessary to build a highway, whether for interstate commerce or for the convenience of mine operation. One mistake the earlier road builders made was that of sustaining the lower side of the roadway by means of rock-filled cribs of logs. This is cheap

these locations have been made and development commenced is a broad zone of gneissoid rock, in which is found disseminated sulphides of the base metals, with gold and silver. This belt, or zone, parallels the Sierra in a northwest-southeast direction. The illustrations on the front page give a good idea of the picturesque region, which abounds in glacial lakes, running streams, moraines, striated rock surfaces and other pronounced features of glacial action. The sulphide minerals occur in finely disseminated grains throughout the semi-schistose rock, which forms what the manager of the Bishop Creek Co.—Ali A. Hassan—believes to be a great mineral belt, which he has called the "Sister Lode," probably in compliment to the Mother Lode. This lode, or zone, possesses no definite walls, but is rather a zone of mineralization which will probably be defined



bed of the stream, he has no more claim to it (21 Cal. 374). But it is always a question of intention. If such discharge of water is made not because it is waste, but for convenience in handling it, intending at the time to recapture it at some lower point, it is not abandoned. For example, water can be discharged into a stream as a link in a ditch line and taken out again, though there are prior appropriators on the same stream. It is not abandoned where there is an intent to recapture it. (C. C. 1413, 11 Cal. 143.) "In the case at the bar the channel of the south fork of Jackson creek is used as a connecting link between the Amador county canal and the ditch of the defendants. The water from the canal is emptied into the fork with no intention of abandoning its use but for the sole purpose of supplying the ditch. There may be some difficulty in cases like the present, in determining with exactness the quantity of water which parties are entitled to divert. Similar difficulty exists in the case of a mixture of wheat and corn, the quantity to be taken by each owner must be a matter of evidence. The courts do not, however, refuse the consideration of such subjects, because of the complicated and embarrassing character of the questions to which they give rise. If exact justice cannot be obtained, an approximation to it must be sought, care being taken that no injury is done to the innocent party. The burden of proof rests with the party causing the mixture. He must show clearly to what portion he is entitled. He can claim only such portion as is established by decisive proof. The enforcement of his right must leave the opposite party in use of the full quantity to which he was originally entitled." (Butte C. & D. Co. vs. Vaughn, 11 Cal. 143.)

An abandonment of waste covers, however, only the specific water that has been actually allowed to run to waste. The incoming water still remains at the entire disposal of the owner of the water right, who may so use it that none of it thereafter runs off as waste at all, or so that it runs off in a different place where the lower claimants no longer can get it. The latter have no right by estoppel to have the abandonment continued, even if they built expensive flumes to catch the discharge (30 Cal. 290, 80 Cal. 181, 108 Cal. 72). Of course, it must be remembered that this applies to claimants basing their rights on use of abandoned waste only. Those who, below stream, have rights of appropriation to a surplus of the natural stream itself, instead of claiming only waste, will be protected, as has been set forth elsewhere.

2. Adverse use. By one allowing another to divert all or part of the water for five years, the right is correspondingly lost to the former and acquired by the latter (32 Cal. 26, C. C. 1007). The adverse use must be made with a claim of right, hostile to the true owner (27 Cal. 360); it must be open and in plain sight, so that one has a chance to prevent it; it must be uninterrupted (27 Cal. 360, 32 Cal. 26). In such a case it is said that a grant will be presumed to have been made to the man who has been so using the water (25 Cal. 392, 104 Cal. 140); though that is merely a fiction of the law. It is not really a grant as a reward of adverse diligence; it is merely that the law will not look into claims that are "outlawed," a punishment for delay.

3. Eminent domain may justify the taking of the water right by the State for public use, on the payment of a just compensation, but it can not be taken without compensation, nor for a use that is not a public use (Cal. Constitution Art. 1, S. 14). Irrigation is such a public use, if the irrigation is for the benefit of extensive farming neighborhoods, and statutes authorizing the taking of streams for such purpose were upheld in *Lux vs. Haggin* (69 Cal. 255). Use for water supply is a public use (Cal. Constitution Art. XIV, S. 1). On the other hand, mining is not a public use, and the Legislature could not authorize water to be taken from private owners to run a group of mines (63 Cal. 72). This difference is probably a sound one, for irrigation builds up the State permanently and makes new gardens and homes out of waste; but mining, it must be acknowledged, is precarious; the more the mines are worked the less there is left; the tendency is to temporary benefit as against the permanent filling out of the State that we see following irrigation on all sides to-day.

**RIPIARIAN RIGHTS.**—It would not do to close an outline of this subject to-day without some words on riparian rights. The law of appropriation is now being more and more crowded by the other system. The two come in contact in many places, some of which we have pointed out, such as the right to appropriate the surplus over what belongs to an upper riparian owner, the right of lower riparian owners to the surplus over a prior appropriation, the right of occupants of land always to be protected in their riparian right against later appropriators. The field is an old and extensive one, on which there is far more decided law than on appropriation; yet here, viewed only as an accessory to the latter, a few words must suffice.

Unlike an appropriation, riparian rights need no act of the owner to acquire them; they attach to the land bordering on the stream of their own accord. The right thereto is a natural right. In ancient times when the law was being shaped the use for drinking purposes was in mind, and to deprive the land owner

of that was not to be thought of. It is a natural right, similar to the right to support from land adjoining, uninterfered with by excavation such as would cause it to cave, a natural attribute of the land itself in its natural state—natural in the sense that it is part and parcel of the land, acquired by virtue of ownership of the land, without any special formalities of any kind (69 Cal. 255 at 390, 126 Cal. 135).

It is usufructary solely and independent of title to the water or the bed of the stream, though the riparian owner usually owns one-half of the bed of the stream. That is, this natural right is one to use the water, not to own it (69 Cal. 255). The kinds of water to which it attaches are, in general, water-courses, lakes and, in California, percolating water (Katz vs. Walkinshaw, 141 Cal. 116). Though it may be necessary to use some other name for the landowner's right in the last case, the principles are the same. Probably the right to-day extends to subterranean streams also (132 Cal. 204), though there is some doubt as to this (53 Cal. 578). But the rights do not extend to mere diffused surface water (69 Cal. 255).

The characteristic feature of riparian rights is that the purpose, amount and manner of use is limited in all directions, so as to be within the reasonable needs of the land to which it attaches.

Reasonable uses include two great classes, ordinary uses and artificial uses (113 Cal. 182). The former includes household use, drinking purposes, watering of domestic animals, etc. For these purposes it is reasonable to take all there is, and lower claimants cannot complain (69 Cal. 255; 116 Cal. 587). It is to supply the ordinary needs of life on the land. But unusual needs, it must be noted, are not within this; watering large bands of cattle are not within the ordinary uses for which the whole can be consumed (69 Cal. 255 at 407). The artificial uses are more restricted in the extent allowed. They include such things as irrigation and the running of machinery. For these it is never reasonable to take all (77 Cal. 66). What is a reasonable amount for such purposes is a question to be decided in each case. The surplus over what is actually consumed must be restored to the stream (69 Cal. 255, 126 Cal. 135).

If the water is not enough for continual use by all, no one of the owners has a right to deprive the others of it on that account for any of the artificial uses; unlike appropriators, the riparian rights of all owners through whose land the stream flows are equal in this. A court of equity will in such a case apportion the water so that each can use all for a time, or assign to each the continual use of his share only, of what there is (113 Cal. 182, *Miller vs. Dondero*, 26 Cal. Dec. 211). It is said that this will be done with percolating waters as well as other kinds. (Katz vs. Walkinshaw, 141 Cal. 116.)

The use is not only limited to the reasonable needs of developing the land, but it must be the land to which the right attaches that it is used for—not for neighboring, distant, or, as it is called, "non-riparian lands." Water cannot, under the doctrine of riparian rights, be used to irrigate non-riparian lands merely because their owner also owns riparian land (77 Cal. 66). What lands are so far from the stream as to cease to be riparian is a question in each case. It is certain that lands beyond a watershed, whence the water could not flow back to the original stream, are non-riparian; and no such use taking water beyond a watershed is sanctioned by the common law of riparian rights (113 Cal. 142, 126 Cal. 135).

The manner of using it must likewise be reasonable.

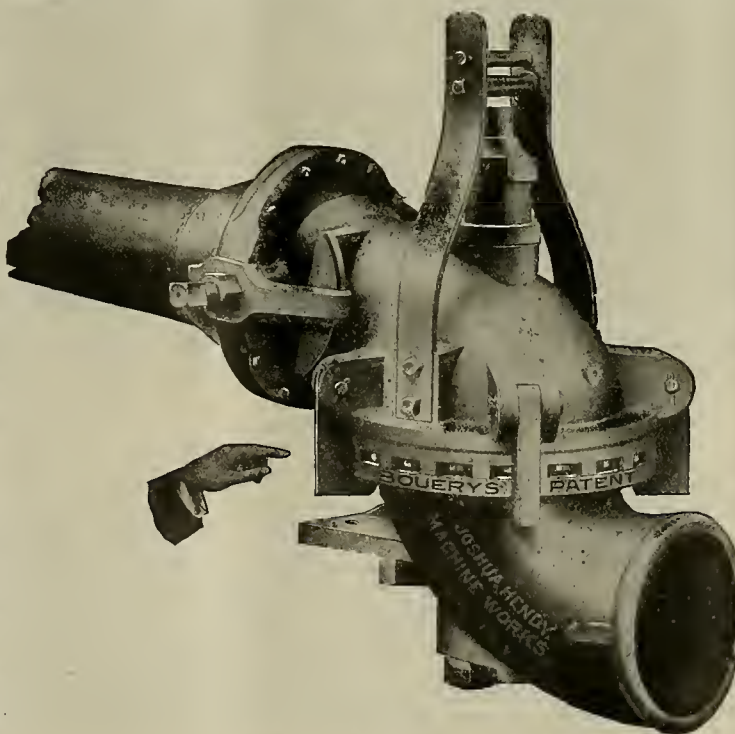
It must not so accelerate or diminish the flow or change the quality that it prevents a reasonable use by other owners, for all are equal in this respect. For example, in 137 Cal. 39 it is said that if trees are cut and thrown into a stream, decaying and unfitting the water for domestic use, the lower riparian owner can have an injunction. Any unreasonable use is actionable immediately, because it violates the natural rights of others, even if they are not using the water themselves (117 Cal. 539). No one has a right to use another's property without his consent, however little use it may be to its owner.

Riparian rights may be lost by adverse use, in the same way as an appropriation may be (126 Cal. 135; 101 Cal. 242). They are also subject to a taking by the State, under the power of eminent domain, in the same way (69 Cal. 255). But they cannot be lost by abandonment, because of the essential difference between appropriation and riparian rights. The former is conditional on continued beneficial use, but the latter is absolutely attached to the land. The former arises from a special grant by the Government; the latter from the land itself, as a natural right. And so, riparian rights remain though the water is put to no use at all (108 Cal. 72). And even if a later appropriator lower down has made use of the water, he cannot complain when the riparian owner starts to use it thereafter (126 Cal. 136).

Many features of the law of riparian rights are elaborately considered in the leading case of *Lux vs. Haggin* (69 Cal. 255).

**CONCLUSION.**—The law of water rights in California shows, more than any other branch of the law, the changes through which California has gone and is now going. It shows how in the early days the miner dominated in the view of the law, getting the then new right to ownership by appropriation established in his favor because the lack of water in mining regions demanded it. How then this new right developed as a favor from the Government, held only so long as beneficially used, an instrument developing the State itself. How the State has more recently grown in other lines, no longer so strongly dominated by mining interests, and has been limiting its indulgence to them; as the rule that a parcel sale is ipso facto an abandonment shows, constructing the law of appropriation more and more narrowly. How the common law of riparian rights has gained the ascendant with the growth of agricultural interests, and causes the rule which is in derogation of it to be less liberally dealt with. Curiously enough it shows the agriculturist favored on the very same grounds that originally were used to favor the miner—public policy founded on the scarcity of water in California. Judge Heydenfeldt's opinion in *Irwin vs. Phillips*, 5 Cal. 140, establishing the law of appropriation, and Judge Shaw's in *Katz vs. Walkinshaw*, 141 Cal. 116, applying the principles of riparian rights to percolating water, are founded both on public policy arising out of the scarcity of water in California, yet reaching almost opposite conclusions.

Taken altogether it shows that the law develops not because the old rules meet with unforeseen natural obstacles, but because they meet with a new development of the people themselves, fitting a natural scarcity of water which has remained unchanged, to the new pursuits in which the people at large engage. But this readjustment should be guarded so as not to unwarrantably interfere with mining, as the new law of underground water, especially, threatens to do.



Bouery's Safety Attachment.

### Bouery's Safety Attachment.

The Joshua Hendy Machine Works of San Francisco, Cal., have added another improvement to their double-jointed ball-bearing giant. The addition of Bouery's safety attachment (patented), illustrated herewith, is designed to add materially to the efficiency of this giant, the intent being to insure safety to the operators and enabling work to proceed without possibility of interruption on account of breakage of any kind—a great advantage where gravels are encountered which are partially cemented and require great pressure to insure absolute disintegration and frequently at a long distance from the bank or wall of gravel. Under such conditions, if the men directing the stream are afraid of the breakage of the giant, they are constantly watching the machine, rather than the bank, their attention being drawn from the spot most demanding it that the best results be obtained. The manufacturers claim that Bouery's safety attachment makes the break-



age of a giant by working pressure impossible, and that the operator of the giant carrying such safety attachment can feel secure against accident and that the stream under his direction does the maximum amount of work.

The manager of the Lagrange Hydraulic G. M. Co., at Minersville, Triunty county, Cal., has four of these improved giants working under a pressure of 450 to 550 feet, and since their installation he writes that he has not had to stop one minute on account of accident. He says: "My mind is now relieved of the feeling of responsibility, which I consider an important matter to a mine manager."

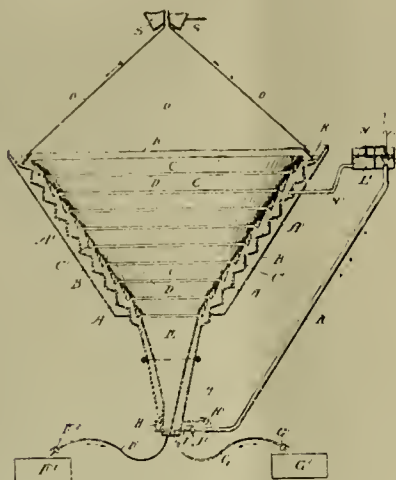
The Joshua Hendy Machine Works of San Francisco, Cal., show illustrations of this improvement and invite correspondence from all interested.

## Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 3, 1905.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METHOD OF PRECIPITATING METALS FROM CYANIDE SOLUTIONS AND REGENERATING THE SOLUTIONS.—No. 778,547; L. E. Porter, Camp Rochester, Cal.



Process of separating metals from alkaline cyanide solutions and regenerating solution, which consists in treating solution with zinc, calcium hydrate and salt of ammonia which will react therewith to liberate ammonia, separating precipitated metals, and adding alkaline carbonate to precipitate part of the zinc as double carbonate of zinc and calcium.

CONCENTRATOR.—No. 778,847; F. M. Dillon and W. G. Wilson, Denver, Colo.



Concentrating table provided with corrugated surface with groups of riffles running whole length of table, one of groups being located at gangue discharge side or edge of table, last named group being high at feed end of table, tapering downwardly for about two-thirds of length, and then gradually rising again at concentrate discharge end or tail of table.

METHOD OF SMELTING ORE.—No. 779,037; J. Gayley, New York, N. Y.

Method of smelting ore, which consists in subjecting ore with carbonaceous fuel to blast of dried air,

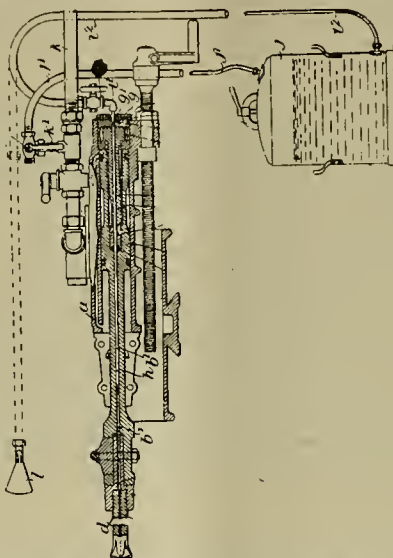
burden of fuel being less than normal burden by amount materially greater than that which would be required to dissipate eliminated moisture.

METHOD OF FORMING BLOCKS OF ORE FOR METALLURGICAL PURPOSES.—No. 778,899; A. Ronay, Budapest, Austria-Hungary.



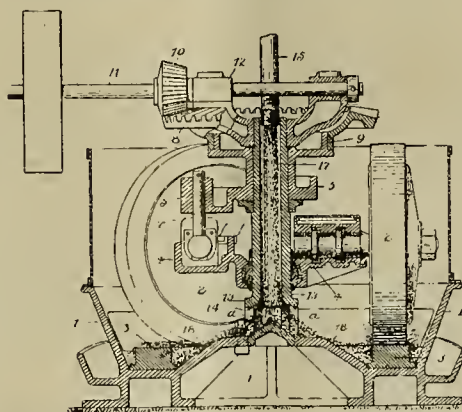
Method of rendering material capable of use for metallurgical purposes suitable therefor by converting it into blocks by means of pressure and exposure of blocks to action of combustion gases containing carbon, which consists in subjecting material, which may be in finely granulous form or in certain cases in form of powder to pressure increasing gradually to high degree (for example 1000 to 2000 atmospheres), so that air entirely escapes from material during pressing operation, and pressure is only carried at last stage to such degree as to render material plastic, whereupon, for purpose of increasing their firmness, blocks are exposed for short time to action of combustion products containing carbon at temperature which prevents any fritting.

ROCK OR LIKE DRILL.—No. 779,017; W. Wilson, Cleator Moor, England.



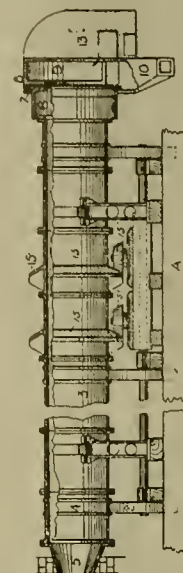
In rock drill, combination of cylinder having axial way through back thereof, hollow piston working within cylinder, hollow rifle-bar working within hollow of piston and formed of shorter length than hollow, hollow piston rod fixed with piston, hollow chuck removably fixed with piston rod and adapted to receive hollow bit, pipe connected with water supply exteriorly of cylinder and passing through and fixed with cylinder end and loosely passing through bore of rifle-bar and entering bore of piston rod and stuffing box beyond end of rifle-bar within hollow of piston for forming fluid tight joint between pipe and piston and piston rod.

ROLLER CRUSHING MILL FOR ORES.—No. 779,045; George Johnston, San Francisco, Cal.



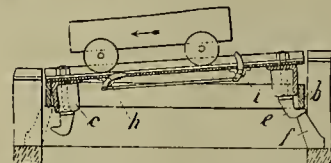
In roller crushing mill, base frame with pan, die ring, and edge rollers running on said die ring, in combination with fixed hollow central standard firmly secured to base frame, forming central conduit for ore supply and lateral support for revolving part, with outlet passages in fixed standard at bottom through which ore is delivered to crushing path from inner side at multiple points.

ROTARY FURNACE.—779,119; H. C. Davey, San Jose, Cal.



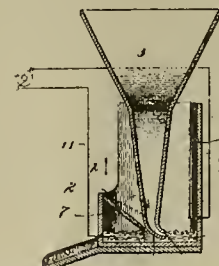
Ore roasting apparatus having in combination plurality of inclined revolvable cylinders each having conical receiving end forming close joint through masonry in which it is turnable, enlarged head fixed to discharge end of cylinder, open at both ends and having projecting flange surrounding outer end, stationary head abutting outer end of first-named head and open at both ends, and having annular channel around interior of inner end to receive surrounding flange, stationary head having chute extension at lower end, furnace communicating with opening in outer end of stationary head and delivering products of combustion thereto and to ore, open uninclosed receiver between chute of stationary head and conical inlet of succeeding cylinder, and thrust bearings to maintain joint between conical inlet and masonry bearings consisting of annular beveled rings on cylinder and corresponding beveled pinions journaled at right angles with cylinder axis.

MINE CAGE.—No. 778,919; P. Thielmann and J. Meisenburg, Duisburg, Germany.



Mine cage comprising in combination with cage frame, loose platform on frame, downwardly projecting catches loosely fixed in platform, nut on upper end of catches, two parallel or cross axles rotatably mounted in bearings on lower surface of platform, curved levers pivoted on ends of parallel axles and projecting with upper ends through platform, connecting rods connecting lower ends of each pair of curved levers and safety bars at side of cage consisting of upright supports fixed to cage frame, suitable bearings at upper end of same, axle mounted in bearings, horizontal levers fixed to end of axle, connecting rods linked to levers and push rods loosely resting on platform with lower ends and linked with upper ends to other end of connecting links, there being eyes fixed to uprights serving as guides for vertical push rods.

GOLD SAVING APPARATUS.—No. 779,365; E. S. Kelley, St. Joseph, Mich.



In gold saving apparatus, cylindrical bucket having outlet opening in side and adapted to contain quantity of mercury; funnel having contracted discharge opening facing away from outlet and arranged to be submerged in mercury in bucket, discharge opening being located at center of lower end of bucket; and inclined amalgamated plate extending from lower end of funnel to edge of outlet opening in bucket, upper edge of plate being curved to conform to curved wall of bucket, and lower edge of plate being raised above bottom of bucket.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The preliminary figures upon the production of gold and silver in the United States in 1904, submitted to the director of the mint, show:

	1904	
	Gold, Value.	Silver, Fine Ozs.
Alaska	\$ 9,000,000	184,320
Arizona	4,250,000	3,400,000
California	19,000,000	1,380,000
Colorado	26,000,000	12,500,000
Idaho	1,960,000	7,000,000
Kansas	9,700	97,400
Montana	4,970,000	12,750,000
Nevada	5,140,000	4,500,000
New Mexico	248,000	180,000
North Carolina	115,400	13,000
Oregon	1,300,000	132,000
South Carolina	113,200	600
South Dakota	7,270,000	185,900
Texas	454,400	454,400
Utah	4,700,000	10,500,000
Washington	310,000	200,000
Wyoming	40,500	13,600
Totals (not including minor States)	\$84,551,300	53,603,000
Klondike	10,300,000	.....
Nome (included in Alaska)	4,878,500	40,300

### ALASKA.

The Record Miner describes a quartz belt extending from Windham Bay, 75 miles southeast of Juneau, to Nowell City, 70 miles northwest of Juneau. At Windham Bay, the Alaska G. M. Co., California-Alaska G. M. Co., Golden River M. Co., Helvetia G. M. & M. Co., Windham Chief G. M. Co., and others are doing development work. Quartz in places has been followed for 25 miles north to Sumdum, where several low-grade properties are being worked on a small scale. Snettisham, 15 miles north, on Snettisham Bay, has a 20-stamp mill, owned by the Alaska Snettisham G. M. Co., of which J. N. Tisdale is president. The mine has been operating for several years. The mineral belt at this point is cut by Snettisham Bay, and a number of promising properties in the vicinity are being worked. Locations have been made along the line of the lode between Windham and Snettisham, proving that the formation is continuous. The belt is next cut at Takou harbor, where the Pacific Cold Storage Co. has a plant for the canning and icing of fish. Several mining locations have been made in the vicinity, and the belt has proved continuous between the last two points. The country between Windham and Takou Harbor is covered with moss, underbrush and devil clubs, and is very thickly timbered, preventing the rapid development of the section. North of here many locations have been made as far as Sheep Creek, the next point where active mining operations are being carried on,  $\frac{1}{2}$  miles southeast of Juneau. A 30-stamp mill is in operation. At the head of Gold creek, which empties into Gastineau channel  $\frac{1}{2}$  mile northwest of Juneau, in the Last Chance and Silver Bow basins, the Alaska Perseverance M. Co., adjoining the Sheep Creek property on the northwest, and the Groundhog group, owned by the Nowell Co., are being developed. The Alaska-Juneau Co., one of the associate companies of the Treadwell management, has a 45-stamp mill, and has two crosscuts, 800 feet apart, which show 1200 to 1400 feet in width of pay ore. Nearer Juneau, the Ebner G. M. Co. have had a 15-stamp mill operating for nine years. Adjoining the Ebner property on the northwest is the Humboldt group, on which a 10-stamp mill is built. From Sheep creek to the Humboldt claims, the mineral belt is unbroken, and is from 500 to 1400 feet in width, being covered with many locations. The Perseverance Co. has crosscut the formation for 2500 feet, and 1400 feet of this is in pay ore. A raise has been made for 300 feet in pay ore, the croppings being 1600 feet above the tunnel. The raise is being constructed to tap the workings 1000 feet above the present terminus. All ore in the Ebner, Alaska-Juneau and Perseverance companies is free milling. The Sheep Creek mines carry 40% of the values in silver. Opposite Juneau, on Douglas Island, are the four groups of the Treadwell mines, owned by the Alaska-Treadwell G. M. Co.; the Seven Hundred and Ready Bullion mines, owned by the United G. M. Co., and the Mexican, owned by the Alaska-Mexican G. M. Co. On Lemon Creek,  $\frac{1}{2}$  miles northwest of Juneau, the Lemon Creek Co. is hydraulicking. Between the Ebner and Lemon Creek groups, a number of prospects have been discovered. Twelve miles northwest from Juneau the Montana Creek or Montana Basin group of properties are 10 miles farther from salt water. At Tee Harbor, 20 miles northwest from Juneau, the mining zone is 6 miles from salt water. One group of claims at that point was recently bonded for \$60,000. The Eagle River M. Co., on Eagle river, 25 miles from Juneau, with B. L. Thane as superintendent, has a 20-stamp mill. Yankee Cove, 5 miles northwest of the Eagle River mines, the Alaska-Washington G. M. Co., B. M. Behrends, president; M. Kelly, vice-president; H. R. Shepard, secretary, and W. Denby, treasurer, has eight claims adjoining the Bessie properties, owned by the Shelton syndicate, 600 feet of tunnel have been run under the ledge, and a camp built for twenty-five men. Berner's Bay is a large indentation of the coast, cutting the mineral belt 55 miles northwest of Juneau. Many locations have been made in the vicinity. The Jualin has a 16-stamp mill and has yielded \$300,000, but the management was compelled to shut down last year because of a flow of water. Large pumps will have to be installed to handle the flow, and this will probably be done during the coming season. At Nowell City, 75 miles northwest of Juneau, the Kensington mines have been handed by the Nowells to J. McDonald, formerly superintendent of the Treadwell mines, for over \$1,000,000. A crosscut tunnel, when in 1200 feet, struck the Eureka ledge 500 feet below the surface. The ledge at that point was 48 feet in width, and carried an average value of \$8 per ton. The devel-

opment under the new bond carried the tunnel in 1800 feet, when the Kensington ledge was struck, showing a width of 96 feet, and the ore averaging \$6, the ledge being tapped by the tunnel at 1400 feet below the surface. The ledge has been drifted 180 feet each way from the crosscut tunnel and the ledge again crosscut at these points, showing about the same width as in the main tunnel and a maintenance of values. This property has at present a 70-stamp mill, but the new management contemplates the installation of 500 stamps in the near future.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The Mitchell Development Co. state that if \$7500 is not forthcoming the affairs of the company must be wound up. Two drill holes had been completed, showing mineral, and a third partly completed when the work was suspended on account of the lack of funds. The directors think the proposed drilling should be completed and some winzes sunk. S. Mitchell is president and general manager and J. Piper is superintendent at Bisbee. The company has 660 acres in Montezuma canyon, Huachuca mountains. Country rocks are red shale, quartz and limestone, with granite porphyry intrusions. Gasoline hoists are used because of the aridity of the region. The plant of the Southwestern S. & R. Co. at Benson has been completed. Another 250-ton water jacket for copper ores will be put in. The smelter will be running by January 15. Bisbee, Jan. 9.

#### Gila County.

(Special Correspondence).—The large tunnel of the Starlight mine, operated by the Tri-Bullion S. & D. Co. at San Carlos, is in 1500 feet and has cut 18 feet of copper ore 1000 feet below the surface. The mine is shipping ore regularly to the smelter at El Paso, Texas. J. C. Erman, engineer in charge, will put in a concentrating plant and an air compressor. San Carlos, Jan. 9.

(Special Correspondence).—A gold strike has been made in the properties of the Lake Superior & Arizona Co. at Superior, 27 miles west of Globe, in the Carleton tunnel, 320 feet below the outcrop. Globe, Jan. 9.

#### Maricopa County.

(Special Correspondence).—F. E. Withey, manager, is putting a power plant and hoist on the property of the Grand Traverse & Arizona M. Co. at Cave Creek. He is developing the thirty claims of the company and has a 140-foot and a 75-foot shaft sunk on the vein. It carries good values in gold, copper and silver. Cave Creek, Jan. 9.

(Special Correspondence).—B. Johnson continues to ship gold from his property near Morristown. J. H. McCabe has discovered wolframite north of Phoenix, about 40 miles from the railroad. R. A. Roberts is working a gold property in the Vulture district. The ore will be hauled to the river, where there is an arrastra. The Mexican mine in Cave Creek district is being worked. W. E. Williams is working a claim near the Union mine, north of Phoenix. De Mund Bros. are working a copper property in the north end of the White Tank mountains, getting shipping ore. The Hassayampa M. & M. Co. have put a whim on their property in the Picacho district, northeast of Morristown. Phoenix, Jan. 10.

#### Mohave County.

The Paymaster mines have been sold to the Victor Paymaster M. Co., represented by F. M. Hamilton of Los Angeles, Cal., and V. P. McDowell and A. M. McDuffee of Chloride. The Paymaster mine is in Paymaster basin, 1 mile north of Cerbat.

The Samoon mine, 4 miles east of Chloride, has been equipped with a hoist, air compressor and drills. L. Hoffman of Chloride is superintendent.

#### Pinal County.

(Special Correspondence).—Gold has been found at the Superior mine, near Silver King, which has formerly produced silver and copper ore. Prospecting for silver is being continued near the Silver King mine. Silver King, Jan. 9.

(Special Correspondence).—At the El Dorado M. Co. on the Gila, near Dudleyville, men are working in the shaft, having sunk 60 feet, and work on the tunnel which is being run to connect with it is being crowded. Dudleyville, Jan. 9.

#### Yavapai County.

(Special Correspondence).—The Treadwell smelting plant at Mayer is completed and will blow in when the ore bins are completed. It has a capacity of 250 tons, having a tuiere dimension of 42x120 inches. On the Queen mine dump of this company there are 4000 tons of ore ready roasted for treatment. The main shaft of the Hackberry is 400 feet deep. Steel-bottomed, broad-gauge ore cars have been ordered. Their 3-mile railroad is finished, touching the Hackberry, Boggs and Queen ground, with terminus at Arizona City, where it connects with the main line of the S. F. P. & P. system, which conveys the product to the new smelter at Mayer. The ore bins for the shaft of the United Verde Copper Co. at Jerome have been completed. Furnace No. 1, which has been down for the past six weeks undergoing general repairs, has been started up, furnace No. 2 being closed down for needed repairs. J. A. Stevenson has discovered mercury in Copper Basin—as red sulphide of mercury (cinabar). Mayer, Jan. 9.

Recognizing the need for deep sinking, the Eureka G. & C. M. Co., after completing assessment work on their claims, 7 miles south of Jerome, are now sinking on the main shaft. C. W. Woods is president, H. M. Gibbs secretary and H. Gilmore superintendent. The Pittsburgh-Jerome will sink 500 feet before crosscutting. C. R. Ewing of Jerome has let a contract for shaft sinking on the Surprise, Lookout and ninety-six claims.

The White Mountain G. M. Co. will put in a 20-stamp mill at its mine near Congress Junction. The power is to be for forty stamps and a cyanide plant. The com-

pany has fifty men at work grading a mill site and a road from Congress Junction to Wickenburg.

### CALIFORNIA.

C. T. Deane, secretary of the California Petroleum Miners' Association, has issued a report by districts of the crude oil production of California during 1904, showing a total of 28,423,700 barrels, which places California far ahead of any other State in the Union, and far ahead of any country except Russia:

District.	Production, Barrels.
Fullerton	876,000
Puente	204,000
Whittier	750,000
Los Angeles	1,080,000
Newhall and Ventura	540,000
Sumnerland	80,000
Santa Maria	750,000
Kern River	376,000
Sunset and Midway	17,500,000
McKittrick	1,050,000
Coalinga	4,544,000
Sargents	12,700
Halfmoon Bay	1,000
Total	28,423,700

#### Alameda County.

The American Magnesite Co., owning magnesite deposits 30 miles from Livermore, will haul the raw material to Livermore and ship to Oakland, where the Rose Brick Co. is to put up a plant at Sessions basin to manufacture brick. In the calcining of the material carbonic acid is thrown off, for which the Pacific Carbonate Gas Co. has been formed to handle it. It is also proposed to manufacture tiling from the magnesite rock by the Plastic Construction Co. H. C. Stillwell, Hayward Building, San Francisco, is manager.

#### Amador County.

The new 20-stamp mill of the South Eureka at Sutter Creek is almost completed, and when it starts the old 20-stamp mill will be hung up. The Zella chlorination works at Jackson have shut down, the supply of sulphur being exhausted, and probably will not start up until the completion of sinking operations and the erection of the new hoisting machinery. The Empire mine in Murphy's gulch, adjoining the Amador Queen No. 2, near Jackson, is being developed under the management of R. S. Green.

#### Kern County.

W. Houser has bonded the Excelsior mine, between Randsburg and Johannesburg, from Fifield, Barton Bros., J. Thompson and T. Seehold of Randsburg.

#### Nevada County.

The Union Con. G. M. Co., near Nevada City, G. A. Nihell, superintendent, is pumping out the shaft below the drain tunnel and will commence sinking. The drain tunnel is in 150 feet beyond the incline.

An agreement has been arrived at in the litigation between the Champion and the Home G. M. Cos. by which the continuance of work in the mines is permitted. Work was stopped a few weeks ago, when the Champion Co. sued the Home Co. for \$300,000 damages and asked for an injunction to prevent the Home Co. from taking ore out of what the Champion Co. claimed was its property. The Home Co. retorted by instituting a suit against the Champion Co. and operations had to be suspended on both sides, causing the laying off of many workmen. The attorneys on both sides have signed an agreement by which the disputed ground is definitely described, and it is stipulated that ore shall not be removed from it during the pendency of the litigation. Operations elsewhere may be resumed. Either party may continue the work of exploration in the disputed ground, but no stoping shall be done, and whatever ore is encountered in the exploratory work shall be stored and be subject to the determination of the controversy in court. Each party gives the other the privilege of inspecting and surveying its underground works prior to the termination of the trial and the submission of the case.

#### Plumas County.

W. J. Droege of Greenville is developing the Johnny Bull mine by a tunnel 7 feet in the clear. The Claybank tunnel above La Porte has struck the gravel channel.

#### Shasta County.

A 5-ton hoisting plant is being put up at the Midas mine at Harrison gulch. The hoist in use will be placed on the 700-foot level.

### COLORADO.

(Special Correspondence).—As the ore in a mine begins to show signs of "playing out," the management begins to cast about for the best method of prospecting the undeveloped portion of the property. For several years past some of the larger mines have kept one or more diamond drills busy doing prospect work. Some of the recent discoveries in the Leadville district are largely due to the diamond drill. Without their aid it would have been almost impossible to prospect the amount of ground that has been prospected in Leadville the past year or two. To sink a shaft or drive a tunnel in the Leadville district was out of the question for prospect work, on account of the water and terrific expense a mine would be under in doing prospect work through tunnels or shafts. With the diamond drill they have been able to sink several hundred feet at hut little expense and at the same time have been enabled to tell the class of ore the drill passed through. With the aid of the diamond drill a manager is able to prospect ahead of his development work and keep a large amount of work mapped out. The superintendent of the U. S. Mint at Denver has received orders to hold all bullion in storage and accumulate a stock for coinage purposes. The State Legislature will be asked to pass a measure making arbitration of all labor difficulties compulsory on both sides. Should such a measure be adopted, it will no doubt be of benefit to all concerned, as it will do away, to a certain extent, with many of the long drawn out contests. The reports received from the various camps for the coming year are encouraging for a good season. Denver, Jan. 8.



## GILPIN COUNTY.

Below is given a table of the milling plants with the location and number of stamps in each mill:

Gilpin County Mills and Location.	Stamps.	Slow.	Rapid.
Chimax, Black Hawk	25		
Fullerton, Black Hawk	33		
Hidden Treasure, Black Hawk	75	10	
Meade, Black Hawk	40		
Polar Star, Black Hawk	40		
Yacile, Black Hawk	35		
Boston & Denver, Black Hawk	80		
Gilpin, Black Hawk	50		
Rocky Mountain, Black Hawk	25		
New York, Black Hawk	50	20	
Raudolph, Black Hawk	50		
Penn., Black Hawk	50		
Iron City, Black Hawk	25	25	
Bonanza, Chase Gulch	25		
Periko, Gamble Gulch	35		
Peterson, Lump Gulch	15		
Avon, Nevada Gulch	30		
Mount & Pal, Pine Creek	10		
Gregory & Buell, Mountain City	45		
Blue Grass, Phoenix	10		
Cheladonia, Wide Awake	10		
Totals	488	300	

A total of 788 stamps in the county, with an average capacity of 1000 tons every twenty-four hours, to which may be added a daily tonnage of 100 tons at the Rocky Mountain concentrator, which, with a daily average of about 100 tons delivered at the sampling works, would make the total tonnage of the camp about 1200 tons per day, with all the plants in full operation. With regard to proposed improvements in quartz mining, the Denver Republican reports that the Gold Dirt M. Co. has decided to erect a modern cyanide plant, with an initial capacity of 100 tons per day, but the mill will be constructed so that the capacity can be doubled if needed. This mill is to be ready for operation by April 1st. It is reported that a custom mill of twenty-five or fifty tons is to be erected at Rollinsville during the early part of the year. The Boston-Occidental M. Co. has expended about \$50,000 on its test plant in Denver and the experimental plant at American City, in the Pine Creek district. The officers claim to have perfected their dry crushing process, the ores being crushed to a 15-mesh and after that wet concentration is resorted to. The company is arranging to cyanide the concentrates. The plant will have a daily capacity of 100 tons, and it is claimed that the new mill is adapted to the sulphide ores of that section. The company figures on erecting a larger plant in Mammoth gulch during the coming year, to handle the product from the mines near James Peak.

Chicago people, interested in the Golden Rod M. & M. Co., are figuring on the erection of a mill to treat their property on Silver creek. Denver and Eastern people, who are operating the Cold Spring tunnel property in Boulder Park, are said to be figuring on the erection of a 20-stamp mill on South Boulder creek during the spring months. The Black Hills & Denver M. Co. is getting estimates on the erection of a 100-ton concentrating plant for the treatment of the product from its Park tunnel properties, and is busy installing a water-power plant for heavier operations.

The Otto Shatz M., L. & D. Co. has a group of four claims in the Lake district, Central City. G. L. Singer is superintendent. R. A. Hastie of Denver is president and general manager.

## LAKE COUNTY.

During 1904 Leadville produced:

	Value.
Gold, 62,152 ounces, @ \$20.67 per ounce	\$1,283,476
Silver, 5,435,442 ounces, @ \$7.24c per ounce	3,108,392
Lead, 46,561,743 pounds, @ .04375c per pound	2,037,076
Copper, 4,638,728 pounds, @ .125c per pound	579,841
Spelter, 85,623,200 pounds, @ .0546c per pound	4,675,027
Manganese, 5,000 tons, @ \$5 per ton	25,000
Total	\$11,708,812

## MINERAL COUNTY.

During 1904 Creede produced: Gold, \$491,408; silver, \$3,624,154; lead, \$1,842,796; zinc, \$213,158; total, \$6,171,516. The total tonnage output from the Creede district for the year was 90,878 tons.

## ROUTT COUNTY.

A company organized by Dr. E. A. Hewitt of Denver will purchase 250 acres of copper mining property on Farwell mountain, east of Hahn's Peak, for \$37,500, from W. McCormick of Elk River, A. Royal and E. F. Carr of Hahn's Peak, G. Withers of Steamboat Springs and G. P. Anderson of Hayden, and will put in a concentrating plant.

## SAN MIGUEL COUNTY.

At the Butterfly-Terrible G. M. Co. mines and 30-stamp mill, near Ophir Loop, fifty-five men are at work; twenty stamps are operated by steam and ten by water power. The 2900-foot tunnel to the Ida vein has been driven 170 feet. J. F. Keating has charge. B. Wells, manager of the Smuggler-Union M. Co. at Telluride, has granted A. Fitzpatrick, E. J. Carter, A. Cushman and A. Darch a lease on ground in the Sheridan workings on the same vein as the Smuggler-Union mines, and the lessees have started active work. The three principal lessees on the Smuggler-Union properties—Wagner Bros., King & Lindsey and the Telluride Leasing Co.—are each employing nearly 100 men which, together with those employed by the company, including timbermen, engineers and tramwaymen and the smaller lessees, make about 350 at work in the property. From 350 to 375 tons of mineral is sent down over the tramway every twenty-four hours, and it is expected this will soon be increased to upwards of 400 tons, the maximum capacity of the two mills.

The Japan M. Co. has resumed operations on the Japan group in Savage basin, near Telluride, under supervision of B. Mattiotti.

The Gold King Basin M. & M. Co. has driven a cross-cut tunnel which has cut the vein. The property is under the management of W. M. Herrington, formerly of Coudersport, Pa. W. G. Shaw is president; W. Conahle, vice-president; C. L. Peck, secretary; W. M. Herrington, treasurer and general manager, and C. DeWitt of Telluride, mine superintendent.

## SUMMIT COUNTY.

A contract for 1000 feet has been let to E. T. Brooks of Breckenridge by the French Creek G. M. Co. The tun-

nel is now in 400 feet and is 5x7 in the clear. Electric power plant is installed with which the electric drill and the Sturtevant exhaust blower will be operated. An electric plant has been put in the Country Boy tunnel to operate the blower for the Juniata vein. The Lincoln G. M. Co. may put in an elevator plant on the Mekka ground in the early spring to elevate the ground to the sluice boxes and to wash the gravel to bedrock until the sluice box is extended.

An estimate of mining in Summit county during 1904 states:

	Value.
Gold from placer mining	\$115,000
Gold from ores	230,000
Silver from ores	177,816
Lead from ores	113,061
Copper from ores	6,293
Zinc from ores	107,835
Total	\$750,005

Placer mining on Blue river and its tributaries near Breckenridge has been active during 1904. The American Gold Dredging Co. has dredge boats operating the Swan river-hed deposits and uses hydraulic giants for the high bars of Gold Run. The Reliance Gold Dredging Co., organized by B. S. Revett, is building a modern \$50,000 gold dredging boat to operate on the bedrock deposits of French gulch. Tests were made by sinking 8-inch churn drill holes to bedrock. The Summit Banner Placer M. & M. Co., L. Kingsbury manager, will operate the Con. Iowa gulch placers this season with hydraulic giants, supplied under a head pressure of 203 feet through a 22-inch pipe line from a storage reservoir.

## TELLER COUNTY.

(Special Correspondence).—There are twenty-four leasers at work on the Hull City placer ground, controlled by the Independence Cen. G. M. Co. This property will be closed down on Jan. 12th for repairs. It will be ten days or two weeks before they will be in position to proceed with underground work. Instead of installing new pumps to handle the water, it is believed arrangements will be made with an adjoining property to pump the water.

Independence, Jan. 8.

(Special Correspondence).—C. G. Jackson, manager of the Mary Nevill Leasing Co., operating on the western slope of Beacon hill, is sinking a shaft to cut the Lenaconing dike which is known to extend through the property. Shaft is down 120 feet and will be sunk 200 feet deeper. It is believed at that depth they will be able to strike the dike as well as encounter the C. K. & N. vein which extends through the gulch. E. G. Taylor, manager of the C. K. & N. mine on Beacon hill, encountered a 3-inch streak of rich sylvanite ore a short time ago. During 1904 this property shipped 10,230 tons of ore with an average value of \$67 per ton. This tonnage was dry weight or after the moisture had been deducted.

The El Paso Con. G. M. Co., W. Bainbridge, superintendent, is handling seventy tons of assorted ore per day. This company has a double-compartment shaft. One compartment is 6 feet long by 5 feet wide in the clear and the other is 5 feet long by 3½ feet wide. The large compartment is equipped with single-deck cage, while the smaller one has a double-deck cage. Two ore cars holding 2½ cubic feet of ore are placed alongside of each other on the large cage. Much time is saved in this manner, as they do not have to raise and lower the cage when loading or unloading, as in case of the double-deck cage. After the men have been lowered for a shift no one is allowed to ride on these two cages. These cages work in balance and carry nothing but ore and timbers. Between shifts, when anyone wants to be raised or lowered in the mine, they are lowered or raised in a small single-deck cage which holds three men. This cage is operated in a small compartment adjoining the larger compartment on the right. This cage is operated by a Hendrie & Bolthoff first motion hoist. The mine is supplied with air by three 12-drill Norwalk compressors. The drainage tunnel is carrying a full head of water, although the pressure is not as strong as heretofore, as the head of water is growing smaller. The cost of the present drainage tunnel was \$85,000, and it is estimated that over \$500,000 has been saved already in pumping alone. The prospects for a larger and more efficient drainage tunnel in the near future are encouraging. Some of the companies which the present tunnel has benefited, and a larger one would still be of greater benefit, are trying to block the progress of the second tunnel, but it is believed that the objection will be overcome. The association will hold its annual meeting January 14 and officers for ensuing year will be elected. The question of a new tunnel will come before that meeting, when steps will be taken to insure the much-needed tunnel. The present tunnel still has about 100 feet of ground to drain. It is thought that it will drain all but about 35 feet of this 100 feet. When it gets to that point the pressure will be so light that it will not act. It is understood the El Paso mine will subscribe \$75,000 towards the new enterprise, and there are a number of other large properties that will come forward with their share of the expense.

Cripple Creek, Jan. 8.

Construction work has begun on the new cyanide mill that is to be put on the Little Giant Co.'s property in Pony gulch, west of Cripple Creek. Alterations are being made in the Columbine mill on the Woods properties, near Victor, which will increase capacity by the removal of the old processes nearly 250 tons daily.

The Pinto-Bison M. Co., J. O. A. Carper of Denver, manager, is operating the Free Coinage ground. They have thirty-five acres, covering the south slope of Bull Cliffs. A new shaft is being sunk on the property, in the town of Altman. This shaft, according to Manager Carper, will be 1250 feet deep when completed. A compressor plant will be installed shortly and the work in the shaft will be pushed with air drills. The shaft is 4x8 in the clear, double compartment. The object in sinking this shaft 1250 feet is to encounter the junction to the Pinto-Basalt dyke with the Wilson vein. J. Wollom is foreman. This same company will sink the Pueblo shaft to the fourth level. At present they are timbering the shaft and putting in new skidway. This shaft is down 163 feet on the incline.

Altman, Jan. 8.

## IDAHO.

## Elmore County.

D. Kirhy, manager of the Monarch mine at Atlanta, Idaho, will put in a chlorination plant. The ore is to be first roasted and then passed into a tank in which the chlorination takes place. After it has been leached the precious metals are precipitated partly by electrical action and partly on zinc.

## Shoshone County.

(Special Correspondence).—An important strike on the Black Horse group at Murray has been made. C. Manley is interested. The Silver Cliff copper mine of the Snowstorm has cut into the east and west vein at 125 feet from the surface. The Champion copper mine, in the Stevens Peak district, has geed ore in their lower tunnel, consisting of chalcopryite in a gangue of white calcite. The Monarch mine, at Murray, has opened up another hedy of good lead-silver ore. T. N. Barnard and E. J. Hunter of Wallace have headed the Knickerbocker group, in the Evelution mining district, near Wallace, for \$15,000.

The Tarbox mine, at Saltese, has crosscut 50 feet into the ledge without reaching the hanging wall. All the large producing mines, except the Hercules, have been connected to the electric transmission line from Spokane, Wash., the Morning mine being the latest to complete connections. The outlook for the Cœur d'Alene mining region for the ensuing year is bright, and it seems safe to say that under the present circumstances the district will exceed the output of last year. This year there will be several important new producers and probably higher prices for lead, silver and copper.

Wallace, Jan. 7.

## Washington County.

The Montezuma M. Co. and the Keystone-Bedie, belonging to Lewis A. Hall, have started a tunnel to tap the Black Garnet, Endline and Keystone-Bedie in the canyon on Browlee creek, ½ mile above the Ruthburg road, near Heatlh Camp.

The Beise Exploration & Mining Co. has bought the Larson placer at Resort, near Warren, and will operate it soon.

## ILLINOIS.

The coal output for the year ending June 30, 1904, was 37,077,879 tons, produced from 932 mines. The total number of tons shipped was 31,778,260. Out of a total of 49,361 men employed underground, 109 were injured.

## KANSAS.

The report of the Prairie Oil & Gas Co. shows the production of the Kansas-Indian Territory oil fields for 1904 to have been 5,599,053 barrels.

## MONTANA.

## Broadwater County.

A. C. Mason has eighty men developing the Park & New Era group, building a sawmill, and concentrator with a capacity of 100 tons per day.

After two years' idleness, operations were resumed by the East Pacific Co. at Winston last July and continued without interruption up to the last of the year, during which time the property yielded \$30,000 in gold.

## Choteau County.

The King-Barnes company mined and treated 36,000 tons of ore at its Alder Gulch property during 1904 and is equipping the shaft with a 16 H. P. gasoline engine, intending to sink deeper. Two new companies were organized for work in the district during the summer and are erecting two mills, each of which will have a capacity of 3000 tons of ore per month.

## Fergus County.

At Kendall the Kendall G. M. Co. produced 108,000 tons during 1904 and will increase the size of its mill. The Whiskey Gulch mine, near Gilt Edge, yielded 3000 tons of ore per month, and the Gold Reef yielded 4000 tons.

## Madison County.

At Silver Star the Green-Campbell Co. has sunk its main shaft 430 feet and will build a 15-stamp mill. The Bismarck-Nugget Gulch Con. M. Co., near Sheridan, worked its mines continuously during 1904 and its 100-ton concentrator and mill since early fall.

## NEVADA.

## Lincoln County.

The Nevada-Utah Mines & Smelters Co. has been formed for \$15,000,000 by J. Weir of New York City, president; E. F. Cragin, vice-president; H. Doud, treasurer; C. J. Caughy, secretary, and J. Dos Passos, general manager, to work the Manhattan, Pioche Cen. at Pioche, Nev.; also the old dumps at Bullionville and Taylorville, the Comet, Imperia and Montreal in Beaver county, Utah, and the Last Chance property at Bingham, Utah. E. F. Fruedenthal, superintendent of the Majestic C. M. & S. Co. at Milford, Utah, is a director. The Savanic and Grand Gulch mines, in the north part of this county, are preparing to ship ores. A wagon road is being built over the Virgin mountains, 40 miles from Grand Gulch, to St. Thomas.

L. Wheatley of Searchlight is developing the Duplex mine. Two shifts are in the mill and seventeen tons are being crushed daily.

## NEW MEXICO.

## Co'tax County.

The steam dredger on the Moreno, near Elizabethtown, is being repaired for operations next spring. The dredger last year produced over one-fourth of the gold credited to New Mexico. The Oro Dredging Co. operates the dredger on the Placer. R. J. Reiling is manager.

## Grant County.

The Bonnie M. Co., S. W. Malthie president and manager, is developing the Lone mine at Lordshurg, and has a double-compartment shaft down 70 feet.

## Luna County.

The Hancock property in the Tres Hermanas district



has been purchased by E. E. Burdick from the Hancock M. Co.—The Tri-State M. Co. has bought the Big Helena and Hard Times mines in the Cooks Peak district. J. E. Britton, who represents the owners, has started development work.

Santa Fe County.

The Sunny Slope M. Co. will start work on the San Lazarus in the New Placers district. J. Jackson is in charge of the machinery and G. W. Churchill is superintendent.—The Gold Bullion M. Co., near Golden, J. W. Wood manager, is installing new machinery to take the place of the old damaged by the floods last October. The company operated a big steam shovel and a Johnson washer in the Old Gulch, near the Kelly wells, 1 mile from Golden. When completed it will handle 2200 cubic yards of dirt a day.

OREGON.

A review of progress in mining in the Bohemia district during 1904 shows systematic development with little hooming. The wagon roads from the terminus of the O. & S. E. Railway have been improved, making the transportation of supplies into the district cheaper. The Oregon-Colorado M. Co. built a wagon road to its property on Anna creek to the county road near Bohemia postoffice; other roads and trails have been built, so that practically every part of the district is easily accessible either by wagon or on horseback.—The Oregon Securities Co. has its 30-stamp mill completed and a tram connecting it with the main working tunnel above. They have driven a crosscut tunnel by machine drills, 1000 feet crossing several ledges of ore, and reaching the Champion vein.—The Crystal Con. Co. is working its properties, but will wait until spring before starting its mill.—The Golden Slipper Co. has opened up fine bodies of ore.—The Riverside group on Horseheaven creek put in a Pelton wheel to run the blower for the tunnel.—At the Oregon-Colorado, contractors are at work upon a 500-foot contract, which, when completed, will place the breast of the tunnel more than 1200 feet from the mouth.—The Great Eastern, Le Roy and Twin Rock properties have been developed. The Royal Flush group and extension are being worked by A. Lundburg.—The Hiawatha M. Co. did considerable tunnel work.—W. H. Shane was developing the Pittsburgh group on the Ridge.—The Golden Rule Co., near Mineral, has been developed under management of W. Wetcher.—A 10-stamp mill, with an aerial tram of 2000 feet from tunnel to mill, was put in by Manager F. J. Hard at the Vesuvius.

Baker County.

The Huntington M. Co. has started work on the Connor Creek placings, 17 miles below Huntington. They have put in 24,000 feet of 34-inch flume and 1500 feet of 11-inch pipe and have two giants operating.

Jackson County.

(Special Correspondence).—The Golden Spike on Wagner creek is one of the Shorty-Hope group of claims owned by the Shorty-Hope M. & M. Co. of Ashland. G. S. Sanford, 130 East Terrace, Chattanooga, Tenn., is interested. The main drift is in 700 feet and the shaft is being sunk through an 8-foot vein of good ore. Ashland, Jan. 9.

Josephine County.

The Golden Drift M. Co. is putting in a 5-step centrifugal Jackson pump at its newly completed dam at Gold Ray, on the Rogue river, 3 miles above Grants Pass. Four 400 H. P. turbines have been placed for power and pipes have been laid from the dam to the Dry Diggings. The pump is designed to furnish 9000 gallons per minute under a 300-foot head to hydraulic giants at the placer mines. The company is now operating near the river with one 3-inch giant with water from Jones creek under 500-foot head. This being insufficient throughout the year, it is hoped to work with water pumped from the Rogue river by power developed by the river. F. Ray of New York is interested.—H. E. Foster of Grants Pass is superintendent at the Oregon Belle mine in the Forest Creek district.—W. H. Brevort of New York and R. N. Bishop, engineer of the Greenhack mine, have formed the Martha M. Co. to work the Seenic, Yellow Dog, Scorpion and St. Peter's claims at Greenhack. It is reported that they will put in a 10-stamp mill on the Seenic, which R. N. Bishop is developing at Greenhack.

The Blue Ledge Copper Co., working on tributaries of the Upper Applegate, intend to put in a compressor plant in the spring and to push development work on their copper shoots.—It is reported that a railroad will be built from Grants Pass to Takilma. T. W. M. Draper of Grants Pass is interested.

SOUTH DAKOTA.

Lawrence County.

F. W. Bock of Rochford has sold his mill to the Commonwealth M. Co. of Lead City. The Commonwealth Co. has driven a double-track tunnel 130 feet and will probably open the vein at about 450 feet.

The Consolidated Power & Light Co., organized by J. J. Henry of Denver, Colo., has taken over the holdings of the Belt Light & Power Co. at Pluma and the Black Hills Electric Light Co. of Deadwood, and will re-equip the Pluma plant, giving it a capacity of 5000 H. P., supplying power to mining companies throughout the district. The Deadwood plant will be dismantled and sold.—The Golden Elk Co. is developing a property near Nigger hill. A tunnel has been driven 120 feet and considerable surface work done. The company intends to put in a power plant. E. B. Sager has charge at Tinton. The Globe G. M. Co. at Lead is building an amalgamating and cyaniding plant, using Trent mills to pulverize the ore. Seventeen hundred feet of drifting and crosscutting has been completed.

The Lucky Strike M. Co. is developing a property near Perry, 14 miles south of Deadwood. A new air compressor has been put in. They intend to build a 60-stamp mill in the spring. A. L. Harris of Reedshurg, Wis., is president.—The Homestake Extension M. Co. is working between Lead and Deadwood and will build a mill in the spring.

UTAH.

Dividends declared by Utah mines during 1904 were:

Annie Laurie, \$100,000; Centennial-Eureka, \$100,000; Century, \$21,000; Daly-West, \$1,044,000; Gemini, \$150,000; Grand Central, \$175,000; Horn Silver, \$80,000; Mammoth, \$120,000; Sacramento, \$20,000; Salvador, \$6000; Silver King, \$1,300,000; South Swansea, \$3000; Tetro, \$18,000; Utah, \$4000; Utah Con., \$900,000; Uncle Sam Con., \$20,000; United States, \$200,000; Victoria, \$7500—a total of \$4,268,500.

It is estimated that during 1904 Utah produced in gold, \$6,518,036; in silver, \$7,774,979; in copper, \$7,221,756; in lead, \$5,020,550; and in quicksilver, amounting to 700 flasks, \$31,500.

WASHINGTON.

(Special Correspondence).—The Braden Copper Co. shipped to Chili the first concentrator for working copper ores ever sent into that country on the steamship Saxonia, accompanied by 1,500,000 feet of lumber for the new mines of the company. E. B. Braden, manager of the company, is in Seattle. E. W. Nash, president of the American S. & R. Co., and B. Sewell are interested in this company. Mr. Braden says: "Chili has, up to a couple of years ago, been producing only from high-grade ores, and it is our contention that we will be able to conduct a more than profitable business there if we only handle the low-grade ores. We took over our property last March, my brother, W. Braden, having left New York last January to investigate the proposition. We intend to push the work of development through as quickly as possible." The mining property is 90 miles from Santiago and the railroads carry the concentrator and machinery to within 30 miles of the mine.

At the annual meeting of the trustees of the Kearns-Montana Coal Co. the following officers were elected: President, J. W. Hill of the Northern Pacific Railroad; vice-president, J. F. Firsch; secretary-treasurer, J. L. Mercer of the Wisconsin Central. The company recently secured 2 square miles of coal lands in the Nicola coal fields, on the survey of the Canadian Pacific, and has outlined a plan of development on its properties in Montana and British Columbia and expects to soon begin shipping.—The Rambler-Cariboo M. Co. is considering an increase of its capital from \$1,250,000 to \$1,750,000 and the additional half million shares of stock will be offered at 12½c each to secure \$62,500, which it is estimated will be needed to develop the mine. All work on the Slocan silver-lead property centers in the driving of a 4500-foot tunnel to catch the lode at depth. It is in 1500 feet. The extra stock will be offered pro rata to existing stockholders and if not taken by them will be probably placed with Eastern interests.—Superintendent Case was in the city from the California mine at Republic and reports the property to be lending fresh encouragement. He explains that the shaft has been in had condition its entire length. Above the 200-foot level some very good ore has been encountered. Prospecting is now being carried on in the upper levels. At the Copper Key several teams are hauling ore to the railroad for shipment to the smelter, but the roads have been had and sleighing is only fair now. C. T. Porter is at Republic to do assessment work on the Golden Lion-Little Four claims.—J. Bourne of Portland, Or., is working the Last Chance group, between Ruhy and Loop.—The deep level in the Belcher mine at Republic, 600 feet below its apex and 1000 feet long, has entered the main ore body. A drift has been driven along the footwall.

Seattle, Jan. 9.

Ferry County.

The cyaniding plant of the Republic P. & C. Co. has been dismantled and shipped to the Crooked River M. & M. Co. at Stites, in the Buffalo Hump mining district. A carload of equipment, including crushing rolls from the mill, has been sold for use at the Sullivan smelter at Marysville, B. C.

C. T. Porter, superintendent of the Little Four and Golden Lion Con. M. Co., is developing the property, near Republic.

Stevens County.

Owners of the First Thought mine, at Bosshurg, have leased the Napoleon mine, 2 miles north of Marcus, on the Kettle river road, the ore of the Napoleon to be used for a lead flux.—At the Big Bear property, 3 miles southeast of Marcus, development work has been resumed by G. G. Reynolds of Marcus.

FOREIGN.

BRITISH COLUMBIA.

Rossland District

The tons of ore shipped and crushed during 1904 in the Rossland mines were:

Le Roi.....	132,267	Cliff.....	1,340
Center Star.....	75,407	Velvet-Portland (milled).....	3,440
Center Star (milled).....	5,732	IX L (milled).....	968
War Eagle.....	56,959	White Bear.....	1,000
War Eagle (milled).....	4,451	White Bear (milled).....	5,040
Le Roi No. 2.....	22,768	Iron Mask.....	70
Le Roi No. 2 (milled).....	11,876	Rossland View.....	80
Spitzee.....	1,069	Golden Rule.....	5
Kootenay.....	5,200		
Jumbo.....	13,519	Total.....	312,325

CANADA.

Yukon Territory.

Gates City, the new town in the Tanana, is rapidly building up.—A strike has been made on Shaw creek, 100 miles above Fairbanks. Over 100 men have gone from Fairbanks and vicinity.—In traveling between Fairbanks and Dawson this winter by way of Circle, one can eat every meal in a roadhouse and have comfortable roadhouse sleeping accommodations every night. Beds are \$1 each. The trip is made in eighteen days.—An unusual steadiness marks the situation in the Dawson markets this winter. The demand is fair, but the supply seems wholly adequate on all lines, and scarcely any variation is perceptible since the close of navigation. Eggs are 50 cents higher, to cover cost of storage.

CUBA.

The U. S. Consul at Cuba, regarding the mining industry in Cuba, says the minerals most abundant in Cuba are asphalt, copper, iron and manganese. Of as-

phalt there are rich beds to be found in the provinces of Habana and Pinar del Rio. In Habana Province are mines known as Jesus del Potosi and Santa Rosa, 1 mile south of Campo Florido. The Rodas Concepcion and Magdalena mines are at the inner end of the bay of Mariel. At Bahia Honda the Santa Elena mine has good asphalt. In Sancti Spiritus is the Pozo Colorado and Ampare mines. Union mine at Guanajay, Pinar del Rio Province, has 10,000 tons annual product; owners, Zardain & Aspuru. The Angela Elmira mine at Bejucal, Habana Province, has an annual output of 3000 tons; owners, West Indies Co. The Maria Rayon mine at Moron, Camaguey; output, 180 tons; owner, M. A. Glynn. The Amparo mine, owner Francisco Moreno, and the Desengano, owner Gerardo Abeign, both located at Sancti Spiritus, Santa Clara Province, have an annual output of 125 tons each. The copper mines in operation are at Cobre, Santiago de Cuba. The Caridad and Concepcion are owned by Maximaliano Salcedo. The Mina Grande is owned by the Cobre Mine Co. There is also copper mining in Pinar del Rio, at the Buenas Aguas, Recompensa, Union, Caridad, and the Cuha Western copper mines, in Habana Province; at Bacuranao, and at Jaruco and Minas; in Santa Clara Province, near Cienfuegos and Santa Clara City; at San Fernando and Santa Rosa, in Puerto Principe Province; the Bayatabo, between the cities of Puerto Principe and Nuevitas, the Marion, the San Antonio del Cerro, and the Cuhillas mines. In all these mines the prevailing ore is carbonate of copper, the extraction of which is found comparatively easy, because it is found at no great depth. The iron mines in operation are owned by the Spanish-American Iron Co. and the Juragua Iron Co. at Caney, Santiago de Cuba Province. The Spanish-American Iron Co.'s mines, Lola, Lola 2d, San Antonio and San Rafael, gave an output last year of 493,860 tons, while the Juragua Iron Co.'s mines, Abundancia, Firmina, Resolucion, Fomento, Jupiter, Union, Constancia and Columbia, gave an output of 235,476 tons; the total output of iron being 729,336 tons. The Vincedore and the Serallo mines, owned by the Ponupo Mining Co. at Alto Songo, Santiago de Cuba Province, produced last year 26,352 tons of manganese. The Boston mine at Caney, Santiago de Cuba Province, owned by the Standard Manganese Co., produced 6267 tons; total manganese produced during the year, 32,628 tons. At Rancho Veloz, in the province of Santa Clara, a mine known as San Juan de Motemho produced 60 tons of naphtha. In the province of Santa Clara have been located the Meloneras mine, near Guarachuya, in the district of Placetas and in the district of Holguin old gold claims have been redennounced, and the only marble of importance is that which is found in the two mountains east and west of Nueva Gerona, on the north coast of the Isle of Pines. The marble is of good quality, ranging from a good white statuary stone through various shades of blue-veined to dark gray. A salt deposit exists near Salinas Point, Isle of Pines. The annual production of the number of mines actually operated, namely, five asphalt, three copper, twelve iron, three manganese and one naphtha, give a total output valued at \$1,446,000, as follows: Asphalt, \$122,900; copper, about \$13,068; iron, \$1,146,892; manganese, \$163,140.

JAPAN.

The Mitsui M. Co., S. Mitsui, president, and T. Dan managing director, is a branch of the Mitsui Bussan Kaisha, with head offices at No. 1 Surugacho, Nihon-hashiku, Tokio, and operating the Mikke, Tagawa and Yamona mines. The Mikke coal mines, in Kiushiu, on the border of the provinces of Chikugo and Higo, near Omuta on the Kiushiu railway, with 16,000 acres, is one of the largest mining enterprises in the world. Several seams of coal occur in the field, but only the first and second seams are worked. The first seam averages 8 feet in thickness of pure, solid coal. The coal has a reddish-brown color, and is a highly bituminous coking coal, being the standard coal in Asiatic markets. The six mines of the colliery produce 3000 tons daily and are equipped with the latest and best machinery for baulage, ventilation and drainage, and everything is done to protect the lives of the miners and to maintain uniform output with a minimum amount of handling. Over 5000 miners and workmen are employed. The Tagawa coal mines, in Buzen in Kiushiu, cover 5000 acres. The total output of the Tagawa mines for 1902 was 366,520 tons. The Yamano concession, in Chikuzen, Kiushiu, with 3500 acres, produced 129,769 tons of a lustrous-black coal in 1902. It is worked from the two seams of 5 and 8 feet thickness, both of which are of similar and even quality.

Since the discovery of a gold mine in Iwate, the authorities have been prospecting and tracing the ancient gold mines in the interior and have found mines at Umegashima, Abe district, Shizuoka prefecture, at Odakimura, Chichibu district, Saitama prefecture, and at Nishizawa, 4 miles from Yumoto, Nikko. The records show that the last mine was practically worked seventy years ago, but since then has been utterly abandoned. The mine is said to have fair prospects if properly worked. It is further stated that great difficulty will be experienced in working the above mines, as they are located in the roughest parts of the ravine.

MEXICO.

Chihuahua.

Weisel & Kock are unwatering H. Losoya's Predilecta mine, at Guanacevi.—S. E. Chaipella of Hollywood, Cal., is developing the Soledad and Constancia claims, near Rio Florida or Villa Coronado. L. H. Powder, manager at the property, is sinking shafts. A. Bronimann of Jimenez and Harmon & Dillon of Parral are prospecting in the same region.

High-grade gold ore has been found in the Quehradillas silver mine, near Parral. G. Gillett is manager. The district has formerly produced nothing but silver.—J. D. Knott, owner of the Prieta mine in Parral, states that pumping machinery will be put in and the mine opened up.

The Minas Almoloaya, S. A., D. W. Shanks, general manager, and N. O. Bagge of Los Angeles, Cal., the principal owner, is working its property at Cerro Almoloaya, between Jimenez and Parral. On its different



properties there has been done 1000 feet of sinking, 600 feet of tunneling and 350 feet of drifting. A telephone line is being built from Derado station, on the Farral branch of the Mexican Central railroad, 5 miles to the mines.—The Companero M. Co., operating in the Sahuaripa district, has made a strike of high-grade ore while sinking its shaft. The property is owned by Los Angeles and Pasadena investors and M. C. Dorr is superintendent.

Corrigan, McKinney & Co. are drilling with two diamond drills on the Nueva Chihuahua mine, in Santa Eulalia, under the superintendency of J. Mitchell.—It is reported that the existence of oil along the surveyed line of the Kansas City, Mexico & Orient Railroad, between Ojinaga and San Carlos, in eastern Chihuahua, is to be proven by W. R. Hearst, J. Follanshee of New York, W. and A. Kraft and C. R. Troxel of Chihuahua.—The United States M. Co., in which J. P. Elkin and T. L. Ayers are interested, is developing the Constancia and San Antonio mines, in Parral district, and expect to put up a cyanide plant.

The Clarinas mine, near the San Francisco del Oro, in the Santa Barbara district, is shipping forty tons of ore per day to the Terreon smelter. It is owned by the Clarinas M. Co., in which N. B. Wilson is interested.

#### Hidalgo.

(Special Correspondence).—J. H. Kinkead is putting in a Kinkead mill at the Guadalupe mine, near Pachuca. It will crush ten tons to 60 mesh. Mr. Kinkead will make tests at the El Oro, near the City of Mexico.

Pachuca, Jan. 9.

#### Sonora.

(Special Correspondence).—A company, C. E. Conway of Pittsburg, Pa., president, and J. R. Smith of Pittsburg, Pa., treasurer, has bought the Guadalupe mine in the Picocho mining district for \$100,000 and propose to erect a 40-stamp mill.—The Oro Maximo Co. in the Picocho district is increasing its force and preparing to do development work on an extensive scale.—The Sonora Bonanza M. Co. in Naco elected W. M. Barker president, R. McCune, vice-president, R. E. Lopez secretary, W. Gmähling treasurer, T. T. Davis and D. Lewis directors. The report of Superintendent Henley stated that 800 feet of work had been done, that there are 5000 tons of ore on the dumps ready for shipment and that a wagon road had been completed from Iduriz, the railroad station, to the mine. It was decided to begin shipment of ore on January 10.

Cananea, Jan. 7.

Taylor & Riadon have bought the Estrella del Norte, near Metecuma, from N. Stuppe for \$30,000. They will put in a pumping plant and a mill.—It is reported that G. F. Woodward has sold the mines of San Juan de Bautista, 15 miles northwest of Metecuma.

J. Henderson, president and manager, and W. K. McKibben of Chicago, secretary of the Campana Minera de Sonora de Cobre, S. A., are visiting the copper property in the Altar district, owned by the Ohio-Mexican M. Co.

At El Oro, owned by the Coast Line Copper Co., of which J. Henderson is general manager, the Huntington mill is being hauled from Poza station to camp.

At the Babacora mine, adjoining the Chispas mine, 14 miles south of Arizpe, 150 men are employed and the 10-stamp mill is running full time. A tunnel 12x15 feet has been driven 1500 feet. R. J. Verner and W. H. Coleman of Colorado Springs are interested.

W. E. Defty, general manager, and J. C. Flores, superintendent, of La Gran Proveedora de Cobre, S. A., report that their copper mines near Caborca, in the Altar district, Sonora, are down 570 feet.

#### SIAM.

H. G. Scott reports to the Far Eastern Review that mining in Siam is confined to tin, sapphires, rubies and gold. It is under the control of the Royal Department of Mines and Geology, and prospecting licenses and mining leases may be obtained without difficulty. Gold is washed out of the alluvium by the natives in Pu Kirin, Bangthaphan, Kow Suplu and Tomoh. In the latter district Chinese workers carry on lode mining as well as alluvial. The native gold mining industry is unimportant, not more than 1000 persons being employed. Modern methods have not been successful in Siam because of the difficult nature of the country for carrying on mining by Europeans and bad management. Sapphires and rubies are the only gems of importance, though spinels, zircons, garnets and topaz are produced to a small extent. Siamese sapphires form a considerable proportion of the world's supply of this gem. Statistics, however, are not available, as there is no duty on the stones, and the work is carried on by numerous small parties of men, and even by individuals, who dispose of their findings to a number of traveling tradesmen. Siamese rubies do not command a good price, as those of good color are mostly very small, while those of good size are of poor color. Practically all Siamese sapphires come from the district of Phalin in Battambang. Rubies are worked in a small way in the same district, but the chief ruby workings are in Chantahoon and Kratt. The gem mining districts are, for the most part, exceedingly unhealthy, this fact being a great bar to European enterprise in this line. Tin is found in small quantities in the valley of the Nam Sak river and in various places in northern Siam, but all deposits of importance are from the line of granitic upheaval forming the boundary range between central Siam and Tenasserim, in the backbone of the Malay peninsula, and may be traced down to the Dutch islands of Billiton, Banca and Singkep. This great line of granite is the source of practically all the vast alluvial deposits of tin which are found in Siam and the British and Dutch East Indian possessions. Tin is being worked on the east coast at Rathuri, Bangthaphan, Langsuan, Chaiya, Bandon, Lakon, Jalor, Rangeb, Rahman, Kelantan and Tringganu, and on the west coast at Kra, Renong, Takuapar, Pangza, Takuatung, Puket, Trang, Stul, Pertis and Kedah. The total annual production is 5000 tons. The mining is in the hands of Chinese, the labor is Chinese, and the melting is locally by Chinese methods. One British and one Dutch com-

pany are working in Kedah, an American company is making a small commencement in Bangthaphan, and a British smelting company is establishing an ore buying agency at Puket. The number of Siamese and Malays engaged in tin mining is very small. There is a large field for the expansion of the tin mining industry in the Siamese possessions in the Malay peninsula, and considerable activity in prospecting on the part of European capitalists has lately been shown. At present Puket island, on the west coast, is the most important tin mining center in all the Siamese States, but Kedah, Takuapar and Renong, also on the west coast, have a considerable mining industry. On the east coast Lakon Sri Tammarat and Jalor (port Patani) are the chief centers. The most promising districts for future developments are in Kedah, Rahman, Jalor, Takuatung and Renong.

## Personal.

D. A. CAVAGNARO is assistant superintendent of the Clover Leaf M. Co., of Roubaix, S. D.

V. C. OSMONT of San Francisco, Cal., is examining mines near Porterville, Tulare county, Cal.

A. C. AIKEN of San Francisco, Cal., is in Santa Eulalia, Mexico, looking after the San Juan mine.

C. J. TEAGLE is superintendent of the Searles M. & W. Co. at Garden Station, near Randsburg, Cal.

J. S. GROO has been appointed superintendent of the Blue Jay Extension mine, in Beaver county, Utah.

S. PEACOCK has been appointed manager of the Ladd Metals Co.'s interests at Mineral and Landore, Idaho.

PH. REARDEN has gone from Baker City, Or., to assume a position with the C. C. Co., Cananea, Sonora, Mexico.

A. L. SORESENSEN has been appointed superintendent of the Jumbo, Trall Creek, Rossland, B. C., by Manager M. R. Galusha.

WM. MAGENAU has completed cyanide investigations for the Rossland Power Co., at Rossland, B. C., and is now in Denver, Colo.

A. G. HARBOUGH of the Kearsarge mine, Virginia City, Mont., will be superintendent of a reduction company at Goldfield, Nev.

J. J. BURKE of Salt Lake City, Utah, is building a cyanide and concentration plant for the Golden Eagle mine at Winnemucca, Nev.

WILLARD BAYLISS of Ironwood, Mich., assumed the superintendency of the Myers and St. Clair mines at Chisholm, Minn., on January 1.

FRED BUTLER of Salt Lake City, Utah, has been made superintendent of the Blue Fields G. M. Co. at Blue Fields, Nicaragua, Central America.

SUPERINTENDENT A. L. ROSECRANS has returned to the Standard copper mines at Clifton, Ariz., from a business trip to Tuape, Sonora, Mexico.

J. B. TOMLINSON, general manager of the Swansea M. Co., has announced the appointment of B. N. Norton as superintendent at Cananea, Sonora, Mexico.

FRED. G. FARISH of Denver, Colo., is at present in the State of Sinaloa, Mexico, where he intends spending the next four months examining mining properties and will make his headquarters at Rosario.

WM. O'SHAUGHNESSY, consulting engineer, who has built over 16 miles of rock aqueduct tunnel in the Hawaiian Islands in the past two years, returned there last week to begin another project.

C. S. MCHENRY, first assistant superintendent of the Cananea Con. Copper Co. mines at Cananea, Sonora, Mexico, has resigned and H. E. Kirk has been promoted to his place. J. Duffin has been appointed second assistant superintendent.

THE Western Society of Engineers, 1734 41 Monadnock Block, Chicago, Ill., have elected the following officers for 1905: President, E. C. Carter; vice-presidents, G. A. M. Liljencrantz, C. F. Loweth, L. P. Breckenridge; treasurer, A. Allen; secretary, J. H. Warder.

R. B. LAMB is making a professional examination of the mines and works of the Westralia Waihi gold mines at Davyhurst, W. A. Before returning to America he will make investigations into recent filter press and slime practice at Kalgoorlie and mill practice of the northern fields.

## Books Received.

Bulletin No. 240, United States Geological Survey, "Bibliography and Index of North American Geology, Paleontology, Petrology and Mineralogy for 1903," by F. B. Weeks.

The United States Geological Survey has issued "Report of Progress in the Geological Resurvey of the Cripple Creek District, Colorado," Bulletin No. 254, by W. Lindgren and F. L. Ranseme; "A Gazetteer of Indian Territory," Bulletin No. 248, by H. Gannett, and "Results of Primary Triangulation and Primary Traverse for 1903-04," Bulletin No. 245, by S. S. Gannett.

Bulletin No. 234 of the U. S. Geological Survey, "Geographical Tables and Formulas," by S. S. Gannett, is a revised and corrected edition intended for use by the topographic corps and others interested in this work. It is a handy compilation of all tables and formulas likely to be required in both the field and office work of all surveyors. The method of fixing a meridian is particularly valuable in its conciseness and completeness

with accompanying tables. The five-place tables of logarithms and circular functions are convenient and easy in use; the tables on projection and for conversion will be great time savors, as will also the stadia reduction tables. The work is accurate and will be invaluable to all surveyors as a convenient reference book. It can be had upon application to the Director of the U. S. Geological Survey, Washington, D. C.

In Professional Papers, No. 30, of the United States Geological Survey, J. R. Leiberg describes "Forest Conditions in the Little Belt Mountains Forest Reserve, Montana, and Little Belt Mountains Quadrangle," and in No. 33 F. G. Plummer and M. G. Gwessell describe "Forest Conditions in the Lincoln Forest Reserve, New Mexico." In No. 31, J. A. Taff gives a "Preliminary Report on the Geology of the Arbuckle and Wichita Mountains in Indian Territory and Oklahoma." These mountains consist of eruptive granites, gabbros and diabase dikes intrusive in Paleozoic limestones. H. F. Bain carefully sampled and assayed many prospects in quartz veins in the granite and gabbro, but found no trace of gold and but little silver, copper or lead. The granite is suitable for building purposes and the limestone for manufacture of Portland cement.

Bulletin No. 235 of the U. S. Geological Survey is "A Geological Reconnaissance Across the Cascade Range Near the Forty-ninth Parallel," by G. O. Smith and F. C. Calkins. It describes geological and forestry conditions in a wild section near the international boundary line in the State of Washington. North of where the Skagit river turns west the Cascade mountains become complex and it is proposed to subdivide them into the Okanogan mountains, Hozomeen range and the Skagit range, from east to west. It is stated that the mountains consist largely of acidic igneous rocks belonging mainly to batholithic masses, and, in a general way, they consist of a synclinorium. They are bounded by slates, greenstones and schists on the east and west. The region is a promising field for gold, silver and coal prospecting. It seems very similar to the Sierra Nevada mountain region in California.

This time has been aptly called "the age of cement." We are surrounded on all sides by streets and buildings of cement. How long will they last? According to F. H. Eno in his book on "The Uses of Hydraulic Cement," it is more durable than stone. He shows the wide application of cement in mortars, in concrete and in reinforced concrete. This book is practical in its descriptions. Certain proportions of certain kinds of sand, gravel and cement will produce certain results if rightly handled. It tells how to mix mortars, the effects of different kinds of sands, the causes of cracks, and then gives numerous examples of its application to structural and ornamental work. The millwright will find cests and descriptions of concrete construction of almost every form. A brief comparison is given of the various systems of reinforced concrete; its strength and adaptability are well illustrated by examples of its use. The whole is told so well that the book is interesting to read. The chapter on specifications is good, it embodies many well-known theories, but presents them in usable form. It forms Bulletin No. 2, fourth series, of the Geological Survey of Ohio. It is seldom that so practical a book for every-day usage is received from government sources. Information is given in a form that can be used by those who have the most need for it. It may be got from the Ohio State Geologist, Columbus, Ohio, or will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of \$1.

## Trade Treatises.

Booklet No. VIII from Borden & Sellick Co., 48-50 Lake street, Chicago, graphically portrays and describes their coal-handling machinery, including their combination elevator and conveyor.

The Ridgway Belt Conveyor Co.'s catalogue descriptive of the Ridgway two-belt conveyor system will be sent to any address on request. Their address is 29 Broadway, New York City. The subject is treated in deserved detail.

"Territory Embraced by the Machinery Sales and Engineering Business of Chas. C. Moore & Co.," San Francisco, Cal., is the taking title of a calendar on a map embracing the Pacific coast from Alaska to Panama, and the west half of the United States.

Advance sheets of Catalogue No. 36 of the 1905 edition of their air compressor catalogue, from the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York, include additional information to that appearing in the first edition, giving fine views of important installations, including those of the Cleveland Stone Co. and the Mare Island Navy Yard.

Gorgeous in quality and numerous in appearance have been the 1905 calendars received this month, but among the host the artistic coloring of the one from the Taylor Iron & Steel Co., High Bridge, N. J., stands resplendent. The "calendar" part of it is a mere caudal appendage, but the picture—"The Historian"—is a splendid piece of color work and as such deserves especial mention.

## Obituary.

GEO. F. BATCHELDER, for many years prominent in mining enterprises in Colorado, died in Minneapolis, Minn., Dec. 31, 1904, in the 77th year of his age. He was at one time president of the Mining Exchange in Denver and interested in mining enterprises in Cripple Creek and Leadville. He went to Colorado about thirty years ago from Faribou, Minn.



## Commercial Paragraphs.

THE Kilgore Machine Co. of Minneapolis, Minn., have consolidated with the A. Carr Co., of that city.

THE Pacific Hardware & Steel Co. of San Francisco, Cal., have absorbed the J. C. De la Montanya Co. of that city.

R. B. McCONNEY, well and favorably known in business circles, succeeds R. J. Cory as Colorado manager of the Allis-Chalmers Co.

THE offices and manufacturing plant of the Globe Iron Works Co. (formerly of Minneapolis), are now located at Menomonee, Dunn county, Wis. The company builds the White gasoline engine.

THE California Powder Co. has leased an entire floor in the Wells-Fargo building, 49 Second street, San Francisco, Cal., removing from their former location, 330 Market street, to larger quarters.

THE De Remer Water Wheel Co., Denver, Colo., has recently installed for the Glenwood Springs Light & Water Co., Glenwood Springs, Colo., one 4-foot De Remer water wheel to operate air compressor and electric plant.

THE Brown Corliss Engine Co., Corliss, Wis., have an order from the Illinois Steel Co. for 2000 H. P. combined vertical and horizontal Corliss engine to be established at their Joliet plant. This engine is of similar design to the engine recently built by Allis-Chalmers, which was exhibited at the World's Fair.

THE Stephens-Adamson Manufacturing Co., engineers, founders and machinists, Aurora, Ill., on January 15th open a Chicago office in the First National Bank building, corner Monroe and Dearborn streets, to better serve their Chicago trade and their outside friends and customers passing through or visiting Chicago.

COLORADO IRON WORKS CO., of Denver, Colo., report the following shipments: Six carloads of concentrating machinery to the Granadina M. & M. Co. in Mexico; one carload of special large capacity ore cars to the Cananea Con. Copper Co., also in Mexico; one carload of crushing rolls to the Montana Zinc Co. in Montana, and six improved impact screens to the Joplin district, Missouri.

THE Smooth-On Manufacturing Co., Jersey City, N. J., sends a pocket book which contains a magnet and a piece of Smooth-On iron cement sheet packing, the latter easily attracted by the magnet, showing the high percentage of Smooth-On contained therein. One of these pocket books will be sent free to any engineer upon receipt of 5 cents to pay for postage. Their Pacific coast office is 61 Steuart street, San Francisco, Cal.

ALL of the stores now occupied by the S. H. Supply Co. at Twenty-second and Larimer streets, Denver, Colo., will be consolidated February 1 and located under one roof, the company leasing for a long term of years the building at the corner of Eighteenth and Lawrence streets, formerly used as the central power station of the Denver City Tramway Co. Besides this building the company has four warehouses, twenty acres of yard room, a mile of trackage at Thirty-first street, where last year 528 carloads were shipped and received.

TURBO-GENERATOR CONTRACTS closed by the Westinghouse Electric & Manufacturing Co. during the last week of 1904 included two 1000 K.W. outfits for the Haverhill (Mass.) Electric Co., to be used in lighting and power work in that city; two 1500 K.W. outfits for the Rochester, Syracuse & Eastern Railroad, and one 1000 K.W. outfit, with exciter, for the Springfield Electric Light Co., Springfield, Mass.; also a 300 K.W. turbo-generator, with exciter, for the Northern Electric & Manufacturing Co. of Montreal. The Springfield Electric Light Co.'s contract also included two 500 K.W. rotary converters and four 300 K.W. transformers.

SMITH, EMERY & CO., chemical engineers, 83-85 New Montgomery street, San Francisco, Cal., from this time on represent the Pittsburg Testing Laboratory, Ltd., inspecting and metallurgical engineers of Pittsburg, Pa., in the Pacific coast States. Hereafter orders for the inspection of bridges, cars, locomotives, building materials, etc., at rolling mills and shops in the East and middle West can be filed with Smith, Emery & Co. All local Pacific States inspection work, physical testing and metal analysis will be done by the resident engineers and chemists of Smith, Emery & Co. The fact that this inspection bureau has found it requisite to make definite connections on the Pacific coast is another evidence of the rapidly growing importance of the trade in construction iron and steel, railroad and steamship equipment and metal industries.

THE annual dinner given by the Paraffine Paint Co. to its traveling men was held on Friday evening, December 30th, in the banquet room of the Merchants' Club, San Francisco, Cal. This is the fourth annual dinner given by this company, these dinners being given for the purpose of bringing together the factory superintendents and the men who are responsible for the selling of the goods. The company has resident agents established in various cities on the Pacific coast, the territory adjacent to these cities being covered out of central offices. Thirty representatives from different parts of the West were seated at the table. A pleasant evening was spent about a bounteous board, and the close of a most satisfactory year's work was celebrated. The utmost good-fellowship prevailed, and the gathering will no doubt prove a source of great benefit to the men and the company. The Paraffine Paint Co. is now in its twenty-first year. It has shown a remarkable growth, and its goods—P. & B. ready roofings, P. & B. building papers, P. & B. and Pabco paints and malthoid roofings—are favorably known all over the West and in all countries whose shores are washed by the waters of the Pacific ocean. Its success, while largely due to the excellent quality of the goods manufactured, is also due to the in-

telligent and energetic way in which these goods have been brought to the attention of users. The works of the company are at Emeryville, Alameda county, Cal., the railroad station being known as Paraffine. The main offices are at 24 Second street, San Francisco, Cal.

THE C. O. Bartlett & Snow Co., Cleveland, O., report the following recent sales of their different machinery: Dundee Silica Sand Co., Dundee, O., elevating and conveying machinery; Leisy Brewing Co., Cleveland, O., tube barley conveyor; Pattison Supply Co., Cleveland, O., coal conveyor; T. S. Henderson & Co., St. Louis, Mo., special cable conveyor; C. L. Holck & Co., Monterey, Mexico, mining machinery; Royal Crown Lead Co., Detroit, Mich., paint machinery; International Harvester Co., Chicago, Ill., paint machinery; Memphis White Lead Co., Memphis, Tenn., paint machinery; Moore Bros., Cleveland, O., and New York, paint machinery; Lowe Bros., Dayton, O., paint machinery; Independent Stone Co., Cleveland, O., two steam hoists and derricks; The Underwriters' Land Co., Carthage, Mo., large ore elevator; Lorain Supply Co., Lorain, O., style E rotary dryer; The Berg Co., Philadelphia, Pa., Triumph steel dryer; General Chemical Co., Cleveland, O., direct heat dryer; Brightman Chemical Co., New Brighton, Pa., salt rotary dryer; Ross Keller Triple Pressure Machine Co., St. Louis, Mo., direct heat rotary dryer.

## Latest Market Reports.

SAN FRANCISCO, January 13, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 27½d (standard ounce, 925 fine); New York, bar silver, 59½c, refined (1000 fine); San Francisco, 59½c; Mexican dollars, 51c; San Francisco, 47½c, New York.

COPPER.—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15.37½@15.50; Electrolytic, 1 to 3 casks, \$15.25; Casting, 1 to 3 casks, \$14.87½. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £68 6s 7d spot per ton.

LEAD.—New York, \$4.70; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 17s 6d long ton.

SPELTER.—New York, \$6.25; St. Louis, \$6.25; London, £24 17s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.05@29.30; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, 32½@35c. London, £131 7s 6d spot.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 15s; San Francisco, local, \$39.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.25c.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., .04c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.60; gray forge, \$15.85; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$21.00; open hearth billets, \$21.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ¾c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ¾c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@25.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 per bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 8½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

OILS.—Linsed, boiled, hbl., 55c; cs., 60c; raw, hbl., 53c; cs., 54c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, hbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 19c; Astral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c; Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., hbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-

glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, ½ lb., 80c.

PHOSPHORUS.—American, ½ lb., 70c.

SILVER.—Chloride, ½ oz., 90c@1.00; nitrate, 55c.

MAGNESIUM.—Pure, N. Y., \$1.60.

MANGANESE.—Per lb., \$2.75.

SODIUM.—Metal, ½ lb., 50c.

BISMUTH.—Subnitrate, ½ lb., \$2.10.

URANIUM.—Oxide, ½ lb., \$3.50.

MERCURY.—Bichloride, ½ lb., 77c.

TUNGSTEN.—Best, ½ lb., \$1.25.

FIRE BRICK.—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$3.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press U. S. and Foreign Patent Agency, the following are worthy of special mention:

SAFETY GAS COCKS.—No. 779,072. Jan. 3, 1905. B. F. Clarke, San Francisco, Cal. This invention relates to a device which is designed for the prevention of accidents resulting from the escape of unburned gas. It consists of an electrical attachment for each gas cock and connections therewith by which an alarm is given at the office or other station whenever the cock stands in position to allow the gas to escape, and means by which the electrical circuit is interrupted when the escaping gas is lighted. Various arrangements may be employed by which notification can be given when a gas cock has been turned sufficiently to allow the gas to escape without being lighted, and means whereby the signal will be silenced whenever the gas is lighted. In this invention an attachment is introduced which is very effective for the desired purpose.

ROTARY FURNACE.—No. 779,119. Jan. 3, 1905. H. C. Davey, San Jose, Cal. This invention relates to improvements in roasting furnaces of that class in which a horizontal or slightly inclined cylinder is revolved upon its axis and the heat of the furnace is applied, the ore being caused to pass gradually from one end to the other. The invention consists in the combination of a plurality of revolvable inclined barrels, each having stationary heads and furnaces connecting therewith, through which heat is delivered to pass through the barrels. These barrels are set with relation to each other and provided with intermediate automatic discharge chutes from the end of one cylinder and receivers into which the ore passes and by which it is delivered to the succeeding cylinder.

GARBAGE CANS.—No. 779,051. Jan. 3, 1905. N. N. S. Matcovitch, Oakland, Cal. The object of this invention is to provide a receptacle and movable support therefor whereby the filled receptacle may be easily lifted by means of a convenient handle and made to dump its contents into the scavenger wagon without any appreciable manual labor being necessary. With a closed receptacle of this sort there is no likelihood of foul smells around a place. Being mounted as it is and so easily handled, there is an incentive to empty it oftener than if in its stead there was a heavy can to be lifted by hand, carried to the wagon and dumped in the usual unsightly and unsanitary fashion.

THE MANUFACTURE OF TORTILLAS.—No. 779,148. Jan. 3, 1905. C. H. Workman and J. Eisenbach, San Francisco, Cal. This invention relates to improvements in the manufacture of tortillas in commercial quantities, and it pertains especially to the manufacture of enchiladas—a composition of meats, peppers, sauces, spices and other things of distinctly Mexican flavor. By the use of this invention the cakes may be made very rapidly and in any desired quantity. No particularly skilled labor is necessary and the tortillas will be of uniform shape and size.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, S. F., has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING JANUARY 3, 1905.

779,250.—VALVE—J. Anderson, S. F.  
779,388.—HEAVING PLUG—G. W. Barnes, Bakersfield, Cal.  
779,394.—STAMP MILL—M. P. Boss, S. F.  
779,347.—BOTTLE CORKER—W. E. Brown, Los Angeles, Cal.  
779,398.—OIL SEPARATOR—A. C. Calkins, Los Angeles, Cal.  
779,072.—SAFETY GAS COCK—B. F. Clarke, S. F.  
779,119.—FURNACE—H. C. Davey, San Jose, Cal.  
779,059.—OIL BURNER—De Remer & Robinson, Los Angeles, Cal.  
779,874.—OIL BURNER—E. B. Estly, Norman, Wash.  
779,361.—DREDGERS—R. G. Hanford, S. F.  
779,401.—TROLLEY POLE—Harrison & Fosdick, Los Angeles, Cal.  
779,967.—METAL WHEELS—J. H. Haskins, San Diego, Cal.  
779,284.—FIRE ESCAPE—Johnson & Smith, Congress, Ariz.  
779,045.—CRUSHING MILL—G. Johnston, S. F.  
779,051.—GARBAGE CAN—N. N. S. Matcovitch, Oakland, Cal.  
779,140.—TUBES—R. M. Nelson, San Diego, Cal.  
779,399.—OIL CAN—Morris & McClair, Index, Wash.  
779,306.—PANIC GUARD—J. P. Page, Portland, Or.  
779,374.—FLEXIBLE SHAFT—R. M. G. Phillips, Los Angeles, Cal.  
779,135.—ENVELOP—Louise Reinhold, S. F.  
779,898.—PUMP—W. W. Robinson, S. F.  
779,380.—BOTTLE—W. A. Statmann, Toluca, Cal.  
779,140.—TUBES—R. M. Nelson, San Diego, Cal.  
779,011.—BRAKE—Stuart & Zimmer, Puyallup, Wash.  
779,146.—TORTILLAS—Workman & Eisenbach, S. F.



# MINING AND SCIENTIFIC PRESS

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## Variations in Cyaniding.

Prior to the introduction of the cyanide process in the treatment of the telluride ores of the Black Hills, little progress had been made toward a satisfactory solution of the vexed problem. It had been possible to save from 50% to 70% of the values contained in the ores by other processes, but this was generally at a cost exceeding the values extracted.

In 1899 experiments were made in wet crushing by John M. Henton, who fitted up the Dakota mill in Central City. In this mill the first experiment made in the Black Hills of crushing in cyanide solution in the mortar was tried and at once proved a success. The mill of the Dakota Co., one of those illustrated herewith, is now in the city of Deadwood. The process, briefly, consists of crushing the ore in a mortar built for double discharge, with a 0.1% cyanide solution. Four pounds of lime are added to each ton of ore to neutralize acidity. It was found that it was necessary to close some of the rear discharges, as the amount of solution with double discharge was very large. The sands are separated from the slimes by cone classifiers, each class going to separate tanks for treatment. The sands are leached with a 0.2% cyanide solution, and the slimes are treated by decantation, or overflow. The slimes being introduced to the tank from below, the solution overflows at the top. By alternate settling and syphoning off the solution is separated from the slimes and precipitation effected in the usual manner. It is stated that the cost of treatment in the Dakota mill is from \$1.25 to \$1.50 per ton, depending upon the magnitude of operations, which is not always up to the full capacity of the mill, as custom work is also done in this plant.



The Lundberg, Dorr & Wilson Cyanide Mill, Near Lead, S. D.

The other illustration is that of the Lundberg, Dorr & Wilson cyanide mill. It is at the Buxton mine, near Lead. It was here the first experiments were made by O. P. Ankeny by the bromine process in 1886. The mill has 75 tons daily capacity. It was the first mill in the Hills to use electric power; to install a Chilian mill of modern type; to employ a belt conveyor for handling materials, and to use the Moore process for slime filtration. The ore enters the mill and passes through a Gates breaker, and then to coarse rolls, which reduces it to about  $\frac{1}{4}$ -inch size. In passing through the rolls cyanide solution

is added, and the crushed ore and solution passes by launder to a Chilian mill. The pulp is lifted by a belt elevator to a classifier where a separation of sands and slimes takes place. The sands are leached and the slimes are treated by the Moore process.

It will be apparent that the processes in these two mills vary chiefly in the mechanical methods employed and not in the chemistry of the process employed. There are in Lawrence county about twenty cyanide plants in operation, including those of the Homestake, which are the largest in the world. Although there is a marked similarity in the ore treated by the various straight cyaniding mills—those in which amalgamation is not practiced, or is at least subsidiary to cyanidation, as at the Hidden Fortune mill—yet there is a notable and interesting difference in the methods of treating these highly siliceous ores. It may be assumed that the variations of the process either represent the preference of the several managers or that some peculiar physical condition in either the ore or the surroundings must be responsible for the difference. It is also apparent that the scale upon which operations are conducted is an important factor in determining the cost of treatment.

The mines in the quartzite and limestone produced last year about one-third of the total gold output of the Black Hills, the balance being derived from the veins in the Archean schists, like those of the Homestake. It is expected the Golden Reward smelter will soon be blown in, and this will probably result in a material increase in output from the mines of this class. The smelter can treat ore at almost as low a cost as that obtaining in the cyanide mills, and can also successfully treat a higher grade ore than is usual in cyaniding practice.



Mill of the Dakota Mining Co., Deadwood, S. D.



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## The Limitations of Electrical Transmission.

The transmission of power by electricity has become so ordinary a thing that electrical engineers are now confidently considering what a few years ago was deemed impossible—the transmission of 100,000 volts over an electric wire. There are numerous installations carrying over 40,000 volts, and in Montana one built to transmit 80,000 volts. One of the latest schemes in Colorado is the proposal to generate electricity in western Colorado on the Grand river and transmit the energy to Denver and mines in the eastern ranges. This will be one of the most extensive installations in the West if the plans are carried out. One of the first electric installations in mining in California was that for the Standard Con. mine at Bodie, Mono county, Cal. This installation, made in 1893, was provided with a generator capable of developing under full load 3530 volts, which was a notable installation in its day. There were other plants, both in America and Europe, where the voltage greatly exceeded that at the Bodie plant; but they were relatively small as compared with the modern installations of the present day. One of the drawbacks to the successful transmission of very high voltages is the difficulty in getting satisfactory transformers which the makers are willing to guarantee. An electric company in Colorado were obliged to make an oil insulated transformer, for the reason that the manufacturers were unwilling to guarantee the transformer made by themselves. As each new undertaking in the way of expansion is successfully accomplished, the progressive engineer is willing to undertake a greater task than the last, and what may be eventually accomplished in electrical transmission can scarcely be surmised.

## Diamond Drilling in Leadville, Colo.

It was to the skillful employment of the diamond drill that the new discoveries of the past year were made in the Leadville, Colo., district. Although mining has been carried on there since 1877 in the lead-silver ore bodies, it is only within the past four or five years that the fact that the ore bodies have a distinct trend, much the same as in veins and deposits elsewhere, has attracted attention. If the ore-bearing strata of the district were undisturbed and had a uniform dip, doubtless the approach to uniformity in the distribution of the ore shoots would have been noticed soon after the development of the camp commenced; but the structural conditions are such as to have a tendency to destroy any appearance of uniformity of occurrence, which really exists. The sedimentary series was deposited in a position essentially horizontal on the floor of an ancient ocean. Later these sediments, sandstone and limestone, were intruded by eruptive rocks—porphyries of various kinds, differing in composition and, to some extent, in age. The first and larger intrusions were of laccolithic type; the later ones of lesser magnitude but of vaster importance, as related to the formation of the ore bodies. They followed the ore deposition. The sandstones became quartzites, the limestones became marble in part and were in part replaced by sulphide ores. Then occurred the faulting and uplifting of the strata into a dome-like laccolith, and the ore bodies of Leadville with their surrounding rocks were divided into a series of irregularly shaped blocks of gigantic size. The faults were not parallel, though approximately so in the greater number of instances. There are also cross faults at various angles and the entire region is thus broken up into independent blocks, the bounding planes of which have broken the continuity of the ore shoots and made a puzzling complex from the originally simple condition.

The faults vary from a few feet displacement to several thousand. To add to the perplexities of the situation, the entire district was planed off by a glacier and a lake formed, covering a large portion of the district, on the floor of which was accumulated a vast quantity of gravel. Subsequent erosion resulted in the formation of the present gulches and the exposure of the few outcrops of ore which exist in the district. In consideration of these conditions, it is not strange that the extension of the knowledge of the mineral zone beyond certain limits has been shown. In addition to the "blind" prospecting which was generally carried on through shafts or underground drifts and crosscuts, there was usually large volumes of water to contend with, and the result of the expenditure of large sums of money was often discouraging. In the early history of the camp some of the most fortunate discoveries of record were made. On Fryer hill the Little Pittsburg ore body which yielded several millions was the result of the fortuitous location of a prospector's shaft in the gravel of the glacial drift. At 30 feet from the surface a mass of iron ore, rich in horn silver, was struck, and it was subsequently proven that this was at the point of nearest approach of the ore body to the surface. A few hundred feet distant a shaft was sunk similarly in gravel on the chrysolite claim. The gravel was passed through, but in place of ore the prospector struck barren porphyry. Disgusted with his luck, the prospector salted his claim, and sold it for a few thousand dollars and decamped. The purchaser of the claim upon discovering the deceit continued his shaft 10 feet deeper, and struck a million-dollar ore body. But these things are of the past, and the miner in Leadville to-day must work systematically in his endeavor to find new ore bodies, but the results accomplished by the intelligent use of the diamond drill in the discovery of new and large ore deposits has opened up a new area of possibility in the Leadville field, and it affords a striking object lesson to miners elsewhere, who may well profit by the experience of the energetic Leadville operators.

ANOTHER suit which had been filed for damages to agricultural interests in Shasta county, Cal., in which the Mountain Copper Co. was defendant, has been tried, and resulted in a verdict of no damage, plaintiff paying the costs. The land which it had been claimed was damaged by sulphurous fumes from the reduction works was located several miles from

the smelter. During the course of the trial it was proven that the owner of the land had filed a statement with the county assessor to the effect that the fruit trees, etc., were of no value, as they never yielded any fruit. This was before the smelter was built at Keswick. It was so clearly an attempt to obtain damages where no damage had been done that the plaintiff received little sympathy. His orchard had been set out along a creek bottom where the early and late frost did much damage, usually preventing the securing of a crop. No attempt had been made at irrigation, and the land was clearly of little or no value for agricultural purposes. The soil in that portion of Shasta county is thin and impoverished at best, and the natural growth of trees is stunted and poor. Gold has been mined over the greater part of that immediate neighborhood, and during the rainy season pocket hunting is still industriously carried on by miners.

## Le Roi Seized for Taxes.

The Le Roi mine of Rossland, B. C., has been one of the concerns to attract a large share of the public attention—from the date when the mine suddenly sprung from a struggling prospector's claim to a paying proposition, valued in the market at nearly \$7,000,000, up to the more recent day of its tribulations. The latest episode in connection with this noted copper-gold mine was the seizure a few days since by the Government of its property at Rossland for non-payment of a tax of \$15,426, claimed under 2% tax on all ore mined and shipped. The original assessment was \$20,000, but the company succeeded in having this reduced to the figure stated. The property was released upon the company's furnishing a bond covering the sum demanded. The company was granted the right of appeal to the Supreme Court, but the Government demanded that the tax be paid before such appeal is taken. The refusal of the Le Roi company to comply with this demand resulted as above stated in the seizure of its property at Rossland.

The smelter at Northport, Wash., is also the property of the company. The company's defense is that they treated custom ores at Northport for which they received no credit, and that they were entitled to a further credit on the depreciation in the price of copper, which occurred during the years for which the Government is endeavoring to collect the tax. It is likely that the case will reach the Supreme Court before a settlement can be reached, and it may result in a change in the method of levying taxes on mining property in British Columbia.

MUCH attention is being given of late to the various methods of preserving timbers. These experiments are made usually on bridge timbers and those used in other open construction work and upon telephones and other poles carrying electric wires, also upon railroad ties. Little, if any, experimenting has been done on mine timbers, probably for the reason that as a rule mine timbers rarely have a chance, for what in other uses would be considered a natural life. They are warped, bent, crushed and broken and have to be replaced with greater or less frequency and have not the chance to prove how enduring preservative applications make them. Moreover, as the preserving process in many instances renders the timbers more brittle than the natural wood it might be of no advantage to treat timbers to be placed in underground workings generally, though where permanency is desired, as at stations, etc., it may be desirable to treat timbers used in such places, making ample allowance for the deterioration due to treatment. There are many places on the surface, however, about mines where it would be wise to treat timbers, with a view to increasing their usefulness and longevity, as in some mill construction, tramways, head frames, towers for the support of aerial tramways, etc., and a variety of other places.

DURING the past week there has been a sharp advance in the prices of steel and iron in Pittsburgh and throughout the East, and copper has also taken another upward movement, being quoted today at 15.5 cents. These higher prices for the leading and most largely consumed metals in the industrial world augur well for the new year. The metal market is an almost infallible index of the condition of industrial life the world over.



## CONCENTRATES.

SILICATE OF SODA and powdered glass or silica (quartz) forms an excellent lute for cementing the covers onto crucibles, etc.

THE various kinds of cement on the market weigh dry from fifty-six to ninety pounds per cubic foot. Granite will weigh about 170 pounds per cubic foot.

TABLES showing the amount of water that can be delivered through pipes of given diameter under varying heads can be found in most engineering books and works devoted to hydraulics.

THE loss of gold in the cyanide tanks by absorption is without doubt a small factor in the losses, which must be looked for elsewhere. Perhaps the fault lies in the precipitation boxes, or in refining the precipitate.

CHYSOTILE is a silky, fibrous variety of serpentine, resembling asbestos. Chrysolite is another name for olivine, a mineral occurring in grains in a number of basic rocks like basalt, diabase, uorite, etc.

THE water pressure per square inch under 500 feet head is 216.5 pounds, and the spouting velocity is estimated at 10,759.96 feet per minute. The estimated power for each miner's inch—1.5 cubic foot per minute—is 1.2 H. P.

IN the construction of towers for aerial tramways, wind stresses as well as direct weight of the load to be carried must be taken into consideration, and where towers cannot be readily braced they should be guyed or anchored to the ground.

WHERE rubber gaskets are used in contact with iron surfaces, it is a wise precaution to rub the surfaces of both rubber and iron with graphite before placing the gasket in position, as it will greatly facilitate its renewal, which will ultimately become necessary.

SOME VARIETIES of crude oil can be used in gas engines. Both in Nevada and in California, Coalinga oil has been successfully used, in preference to gasoline, or distillate, in the gas engine, for hoisting, running pumps, mills, etc. The very heavy oils are not suitable for this purpose.

LEAKS in pipe lines are sometimes stopped, temporarily, at least, by throwing sawdust into the box at the head of the line. This is carried into the pipe and more or less of it finds its way to the leaks, and clogging the small aperture stops the leak. In some cases this simple remedy fails of satisfactory results.

THE legalized miner's inch in Montana and California is 1.5 cubic foot per minute. As this establishes a standard of measurement, it is being generally adopted in other States, as it avoids the confusion created by the varying head under which water has been measured by various water companies.

THE general belief is that copper plates, whether silver plated or not, absorb gold when used for a long period for amalgamating gold in the mill. There are those who contend that this is not a fact, and that if a plate be thoroughly scraped down to bright copper, no more gold can be obtained by scraping, sweating or even by the fire assay.

THE greatest annual production of gold and silver in the United States, according to the Mineral Resources of the United States for 1903, was in 1901, when it reached \$153,704,495. Of this amount \$79,171,000 was in gold. The gold production of 1902 was \$80,000,000. The largest amount of silver produced in one year was in 1892, when it was \$82,101,000 (coinage value).

A GOOD CEMENT for iron may be made in the following manner: Clean, fresh iron filings, 40 parts; manganese dioxide, pulverized, 10 parts; sal ammoniac, 1 part; Portland cement, 20 to 40 parts. Add water to form a paste. Flower of sulphur may be substituted for the manganese dioxide. When this mixture is made galvanic action causes rapid oxidation of the iron, the volume swells somewhat and the mass forms a firm cement.

IT is thought by many mill men that the continued and often heavy vibration caused by falling stamps is detrimental to the best results in amalgamation. That this is probably a mistaken idea is suggested by the successful use of "bumping" amalgamation tables, and the recent substitution of silvered-copper plates on old vanners in a mill on the sand where the shaking and great vibration of the plate has resulted in catching a large amount of free gold which would otherwise have gone with the pulp to the cyanide works.

IT is customary to do all mine surveying with a fixed needle and a vernier, owing to the magnetic attraction found in mines, due to the presence of tracks, drills and other tools. Some rocks contain a sufficient percentage of magnetite or pyrrhotite to deflect the needle several

degrees. When surveying with a needle on the surface the surveyor should be careful to remove all iron and steel objects from the person, such as keys, knives, buttons, buckles, etc. On one occasion the writer set up a compass on a mine and left it for several minutes for some purpose. On returning the needle had come to a state of absolute rest, but upon approaching near enough to read the plate the needle was deflected 4° by iron and steel objects in the pockets. Needle surveying is only approximate in accuracy at best.

PRODUCER GAS is made from any kind of fuel. In small-sized plants anthracite coal, coke or charcoal is preferred, though wood may be used. The gas is made in a device called a producer, of which there are several makes. It is claimed that producer gas is the cheapest form of energy from fuel. Its calorific value is about 140 B. T. U. per cubic foot of gas. It is made by passing steam through a bed of incandescent coals in a closed producer. The fuel is converted into fixed gases and only ash remains. It is used for power, fuel, heating, etc. Its use is extending.

THE velocity of a stream is not equal throughout its entire depth. Recent extensive experiments made by hydrographic engineers of the United States Geological Survey determine the mean velocity to be at a point from 58% to 73% of the depth of the stream; depending upon the character of the bed, whether rough or smooth. The mean depth is 61%. The United States engineers have adopted six-tenths of the depth of the stream as the point of mean velocity, and experiments carefully made show this to be about correct, the variation being from -6% to +4%, with a mean of 0%.

WATER is lifted by the hydraulic ejector and also by compressed air. In each case the method of operating is essentially the same. The water or air is carried down under the surface of the water to be lifted, and the pipe there reduced in size to a nozzle-like termination is turned upward into the lower end of the column pipe. The great upward force of the water, in its effort to seek its own level—the pressure head—carries with it by suction a quantity of water from the body of water in which it is immersed. The water rises steadily in a solid column and is discharged. The efficiency of the hydraulic elevator is relatively low. In the air-lift the air enters the lower end of the column pipe and beneath the surface of the water and forces a quantity of water upward in the pipe. The water is carried upward in a series of detached sections, with an air space or cushion between them, making the discharge intermittent.

WHERE A locates a claim on a vein, and subsequently B locates one adjoining, the vein running with a sinuous course along A's side line, crossing and recrossing the line, but dipping away from A's claim, B has an extralateral right on that segment wholly within his own claim where the discovery was made, but that he may have the same right on the several other segments lying within his claim without making a discovery for each separate segment is a question. There appears to be no precedent for such a case and it might be necessary to carry the question to the Supreme Court of the United States to get a final decision. A is entitled to all the lodes or veins found within his claim and is entitled to the extralateral right on each of the several veins or portions of veins having their apices within his lines. It would seem that B might have a similar right, but the question is, as previously stated, without precedent. As to a cross lode, B has no right within the lines of A's claim for any purpose, in either Arizona or California, according to court decisions.

AN EXTENSIVE list of minerals occurring in California was published by Henry G. Hanks in the fourth annual report of the State Mineralogist of that State in 1884. This list referred more particularly to those minerals of economic importance. Tellurium-bearing ores are found in a number of localities in California. Among these are altaite, telluride of lead, at the Rawhide mine, Tuolumne county; calaverite, a gold and silver telluride in Calaveras and Tuolumne counties; hessite, a silver telluride, found in a mine near Georgetown, El Dorado county; petzite is a variety of hessite, the silver tellurium. It has been found in the Stanislaus mine of the Melones Co. at Robinsons in Calaveras county. Sylvanite, a complex telluride of gold, silver, antimony and lead. This is also found in the Stanislaus and Melones mines. Native tellurium and the rare telluride of nickel, melonite, have been found in the Melones mine. There are other tellurium minerals reported from the interesting groups of mines near Carson Hill, but their identity seems doubtful.

A PERCH of stone is 16½x14x1 feet and contains 24½ cubic feet. A good concrete is made in the following proportions: Clean, broken rocks, 4 parts; sand, 2 parts; cement, 1 part. To make a perch of concrete, take 2500 pounds broken stone; add 1250 pounds sand and 625 pounds cement. The addition of sand and cement does not increase the bulk of the concrete. This is determined by the amount of broken rock employed. The sand, cement and water merely fill the voids or spaces between the pieces of broken rock. Consequently, when the quantity of concrete is known in cubic feet, the amount of the several ingredients may be calculated closely. The proportions are as 1:2:4 for cement, sand and

rock, and 1:2:4:8 for cement, sand, gravel and rock. Someone has said that, when getting the stone for a mass of concrete, "get all the stone that in your judgment is required—and then get as much more." It is not of infrequent occurrence that inexperienced concrete makers underestimate the quantity of stone required. Slow-setting cements are best for concrete, particularly for those that are to be rammed.

A DIRECTOR and stockholder of a mining corporation, who has served also as superintendent at the instance and request of the corporation, is entitled to be paid for his services as superintendent. The salary of superintendent is usually fixed by the by-laws; but, in the absence of that, if there has been an express agreement upon the amount he was to get, by a valid resolution of the board of directors, wherein his own vote was not necessary to carry the resolution through, the corporation will usually be bound thereby. If there has been no express agreement, he will be entitled to the amount his services as superintendent were reasonably worth. His being a director has the effect in some cases of limiting the amount he can demand as to what his services were reasonably worth, even though there was an express agreement fixing his salary at a larger sum, but it does not otherwise affect his position as a creditor of the company. He may enforce his claim for services in the same way as other creditors, by suit and attachment, or, if his superintendency involved active physical labor, by filing a lien under the mechanics' lien law.

ZINC is not in evidence in the upper portions of some veins where it was originally a portion of the ore deposited there. There are two theories which are advanced to account for the fact that some mines which show little or no zinc near the surface sometimes develop the sulphide of that mineral in considerable amount in depth. One is that zinc sulphide is one of the first minerals to be precipitated in veins from its mineral solutions coming from depth. The other is that the zinc was originally precipitated together with other base metal sulphides, but that subsequent decomposition resulted in the oxidation of the zinc sulphide to zinc sulphate which, being soluble, was carried away by downward percolating surface waters, and consequently little or no zinc mineral is seen in the upper levels, where zinc blende may prove to be an important constituent of the vein below the drainage water level of the mine. In some instances zinc silicate or zinc carbonate are abundantly deposited in an intermediate zone as a result of the alteration of the surface ores by oxidation, but as often the carbonate and silicate are absent or exist in so small amount as to attract no attention.

THE hardening of steel is due to suddenly arresting the progress of a change which otherwise takes place in the condition of the steel when slowly passing from a higher to a lower temperature. The metal having been completely and suddenly cooled, no further change can take place. This is accomplished by plunging the red hot steel into water. In the case of a pick, the steel point is burnished by the blacksmith—generally by rubbing on a board covered with sand. This brightens the surface of the steel. The shank of the pick still retains a high heat, sufficient to carry it down to the point. Watching it closely, a beautiful dark blue color is soon seen. Just at the moment this reaches the end of the pick point, it should be given the final plunge, and the point will retain this color, dark blue, and is the best for hard rock, as well as that which is softer. Drills may be tempered in much the same way. Usually drills are heated and forged and thrown down to cool, being afterward reheated, plunged and tempered by allowing the color to run down to the bit, but drills for hard rock should be tempered from straw to light bronze color, blue being too soft. In heating to forge or to temper, care must be taken not to overheat the steel, as this burns out the carbon and ruins the steel for any use and the burned end must be cut off and thrown away, causing a loss of fuel, time and material.

SODIUM AMALGAM is composed of sodium and mercury. It is made in a quicksilver flask from 3 parts of sodium and 97 parts mercury. Bury the flask in a sand bath on the furnace, nearly up to the neck of the flask. This is brought to a temperature of 300° F. Place the mercury in the flask first and then add the sodium in small pieces—the size of a pea—waiting each time until the violent action stops before adding another piece. It is better to handle the sodium with tongs and protect the hand with a cloth or glove, as the addition of each piece of sodium is followed by a slight explosion and a jet of flame issues from the flask. The action becomes less pronounced as sodium is added. When all of the sodium has been added, pour while still liquid into a flat dish. The mass will solidify when cold and may be broken into small pieces and placed in a stoppered jar. Sodium amalgam forms in bright, metallic needle-like crystals, which interlace in every direction but are loosely coherent. The amalgam thus prepared is used by pulverizing to a coarse powder, and sprinkling over the surface to be amalgamated, which is previously wetted, and then going over it with clean mercury. The result is a perfectly amalgamated surface, but in case of bad plates it may be necessary to repeat this a number of times, until a good layer of gold amalgam has been formed on the plates. This can only be possible by not removing the gold as fast as it is deposited—a too common practice.



## The Mines of Cripple Creek, Colo.

The recently completed resurvey of the Cripple Creek, Colo., district has resulted in the securing of considerable additional valuable information. There are about 300 mines in the district, some of which are idle; numerous others have been consolidated into groups, which have become familiar by name to mining men everywhere. The deepest mine in the district, measured from the collar of the shaft, is the Lillie, down 1500 feet.

The width of veins stopped ranges from 3 to 50 feet or more. The stopes are sometimes filled, but are often left open after the broken rock between levels has been drawn off. Operations are facilitated by the great hardness of the rock, stopes 200 feet or more in height sometimes standing for years. The ores are not adapted to concentrating by ordinary means. Hand sorting and washing, the latter in order to separate the fines, are the methods employed. More care is now taken than formerly, but at many places there is still room for improvement.

The recently issued bulletin No. 254, by Lindgren and Ransome of the United States Geological Survey, gives the following resume of the mines of the district:

**BRIEF REVIEW OF THE MINES.**—The productive district, as stated above, is practically covered by the area of a circle  $3\frac{1}{2}$  miles in diameter. The center of this circle would be located half way between Raven hill and Bull hill, and the towns of Cripple Creek, Victor and Cameron would be situated on its periphery. A very few mines—notably the Galena and the Fluorine—and many prospects lie outside of this area.

The culminating points of the district are found in a ridge of high and bare hills that extends in a northwest-southeast direction and divides the waters flowing into Cripple creek and Wilson creek on the southwest from those joining Spring creek and Grassy creek on the north. From northwest to southeast the following hills mark this divide: Mineral hill, Carbonate hill and Tenderfoot hill, north or northeast of Cripple Creek; Globe hill, Ironclad hill and Bull hill, the latter being near the center of the district and equidistant from Cripple Creek and Victor; the ridge is continued by Bull Cliff and Big Bull mountain, the latter, really outside of the productive area, being the highest point in this dividing range of hills. Its elevation is 10,826 feet. Three long spurs project to the southwest from the dividing range separating the deep trenches of Cripple creek, Squaw gulch, Arequa gulch and Wilson creek. The first, called Gold hill, rises directly east of Cripple Creek; the second is Raven hill, being continued to the southwest by the lower spur of Guyot and Beacon hills; the third is Battle mountain, continued by the almost equally high salient of Squaw mountain.

The important mines are situated in this region of sharply accentuated topography. As has been several times emphasized, the volcanic area practically coincides with the hills and ridges just described and is surrounded on all sides by granitic rocks.

Globe and Ironclad hills and Gold and Raven hills consist chiefly of heavy masses of breccia and were scenes of great activity during the early years of the district. Near Poverty gulch, just northeast of Cripple Creek, is the Abe Lincoln, not a large mine, but still actively worked with satisfactory results. Higher up are the Gold King, with dividend records of \$150,000, and the C. O. D., with a reported production of \$600,000 and dividends of \$150,000.

On the summit of Globe hill are the Stratton properties of Plymouth Rock and Globe mines, in which extensive low-grade mineralization without many sharply defined veins seems to be the rule. Adjoining is the property of the Homestake Co., including the Ironclad mine, where direct cyaniding of oxidized surface ores is now carried on in a mill erected on the property.

Gold Hill is crowned by the Anchoria-Leland mine, with a production of over \$1,000,000. The shaft is 1100 feet deep. The adjoining Moon-Anchor has paid dividends of \$261,000, and the Half Moon (Matoa G. M. Co.) has a gross production of \$650,000 to its credit, but is reported to have paid only a small amount in dividends.

On the western slope is the Midget mine, actively worked at present, with a depth of 800 feet, a total production of \$662,000. The Conundrum, in the same vicinity, is likewise worked with good results to a depth of 600 feet. The Midget, like the mines described above, follows a vein in breccia, while the Conundrum is mining on a basalt dike in granite, close to the contact of the breccia.

In the deep gulch between Gold hill and Raven hill are situated the Anaconda, Doctor-Jack Pot and Mary McKinney mines, all working on sheeted zones forming lodges in the breccia. The Anaconda produced about \$1,000,000, chiefly from upper levels, and is now idle. The Mary McKinney is one of the most successful mines worked at present in the district. Its depth is 600 feet. The Doctor-Jack Pot has \$4,000,000 to its credit and likewise a handsome dividend record. The shaft is only 700 feet deep, water having until now prohibited deeper sinking.

The breccia granite contact is found on Guyot hill a

short distance south of the Mary McKinney. The extreme spur of Raven hill, called Beacon hill, is formed of an intrusion of phonolite in granite, and about this outlying volcanic center cluster a group of veins of great production and promise. On the eastern side of the hill are located the Prince Albert, Gold Dollar and others, not active producers at present, while on the western side lie the El Paso, C. K. & N. and Old Gold mines, with their narrow but extremely rich fissure veins in granite, now actively and successfully worked.

A great number of smaller mines have been worked on veins cutting the breccia of Raven hill. The Elkton mine is situated in the deep hollow between Raven hill and Battle mountain. It has been working on an exceptionally long vein, partly contained in breccia, partly in granite, and generally following a basalt dike. The production approaches \$6,000,000 and the depth attained is about 900 feet, excessive water having formed a serious obstacle to deeper sinking. The Moose mine, situated higher up on the slope of Raven hill, had a good ore shoot, from which \$500,000 was obtained.

Northwest is the summit of Bull hill, which affords a magnificent panorama, not only of the whole camp, but of a large part of the State of Colorado. Toward the east, and 5000 feet lower, spread the great plains at the foot of the Rocky mountains; westward the Sangre de Cristo, Collegiate and Mosquito ranges—a snowy and jagged line of ramparts—define the distant horizon.

A multitude of small mines occupy the southwestern slope of Bull hill. On the northwestern side an area of brecciated granite appears among the volcanic rocks, and in this formation is situated the Wild Horse mine. This lode, which has been worked to a depth of 1250 feet, has produced over \$1,000,000, and is now operated by lessees. A number of smaller producers may be found on the northern slope toward Cameron, among them the Damon, Jerry Johnson, W. P. H. and Pinnacle.

The mines are chiefly situated on the periphery of a circular area, the central part of which, comprising the upper part of Squaw gulch, has thus far yielded very little. Few strong veins have been met with in this part of the breccia; but, on the other hand, the developments in depth are not extensive.

On the east and southeast side of Bull hill begins that most important belt of lodges which extends southward to Victor and includes the richest group of producers in the camp. A characteristic feature of this belt is the intrusion into the breccia of thick masses of trachytic phonolite and syenitic rocks.

With few exceptions the veins of this belt strike north-northwest. We may begin the description with the system of linked veins, 3000 feet long, covered by the Isabella and Victor mines. The last-named mine, on the southern end of the system, is situated just below the western slope of Bull Cliff. It has been worked to a depth of over 1000 feet and has produced about \$2,200,000. The Isabella has attained a depth of 1127 feet and produced \$3,200,000. Both mines lost their pay shoot in depth.

The small but rich cross veins of the Empire State, Burns, Pharmacist and Zenobia connect this vein system with that of the Stratton mines on Bull hill. South of the Burns begins the Vindicator vein system, traced southeasterly for a mile through the Findley, Hull City, Vindicator, Lillie and Golden Cycle mines. The Hull City and the Lillie have each produced over \$1,000,000, the Vindicator and Golden Cycle over \$2,000,000 each. The Vindicator is 1200 feet deep. All of them, except the Lillie, are still actively worked. In the whole system water has been and is still a source of trouble. The deepest mine evidently drains all the others in this vicinity.

The Stratton properties on Bull hill, with the Logan, Orpha May and Pikes Peak veins, on which maximum depths of 1200 and 1500 feet have been attained, are now worked only to a slight extent, whereas in the early days of the camp they were highly productive.

This vein system is continued southward in the Last Dollar mine, now working at a depth of 1270 feet. The production exceeds \$1,000,000. South of the Last Dollar the veins enter the Modoc ground, a mine worked for a long time and with gratifying success. The Blue Bird, an old-time producer, is situated a short distance west of the Last Dollar.

South of the Modoc is the Battle mountain vein system, crossing from the granite into the breccia, with general northerly or north-northwesterly directions, and distinguished by heavy production and ore bodies of imposing size. None of the veins are of great length, and the whole system extends scarcely a mile along the strike of the veins. The veins can not be directly connected with others already described, though, in its general trend, the system heads toward the Dexter, Blue Bird and Moose veins.

Beginning on the southwestern side, we first come to the Gold Coin mine, the veins of which are in granite; one of them is successfully worked at present at a depth of 1200 feet. The total production approaches \$6,000,000. North of the Gold Coin is the Ajax, working partly in veins, partly in large, irregular ore bodies in the granite. The depth attained is 1200 feet.

Between this and the Portland vein system, almost within the town of Victor, are the Granite, Dillon and

Dead Pine veins. They are worked at present at depths of from 800 to 1000 feet.

The Portland vein system begins on the south at the Strong mine, now worked at a maximum depth of 900 feet, on a vein in granite that follows a basalt dike, which is in places accompanied by a phonolite dike. The mine is an unusually regular and profitable producer, the total dividends since 1892 amounting to \$2,500,000.

The veins of Stratton's Independence run about parallel to those of the Strong, a few hundred feet eastward. They extend from the granite into the breccia, following for some distance a phonolite dike. The production of this mine amounts to over \$11,000,000. At present the company is leasing the various levels to tributaries. From the two properties last described the vein systems continue into the Portland mine, but in the northern part of the property are replaced by another and still richer aggregate of veins, the Captain system. The Portland is, beyond question, the most prominent mine of the Cripple Creek district. Its total production from 1894 to the end of 1903 amounted to \$18,000,000, derived from 466,000 tons of ore (both in round figures).

**OUTSIDE MINING PROPERTIES.**—The area outside of the principal volcanic area contains very few productive properties, but it is by no means barren. A great deal of money has been spent here, usually with unsatisfactory results. Although there are many properties of merit, and although much honest effort has been made in this part of the district, it has long been the favorite camping ground of concerns more or less lacking in stability.

The granite hills west and south of the city of Cripple Creek contain few prospects; phonolite dikes occur in places, but usually show little value. Along Gold Run and Arequa gulch prospects with a little ore have been found, down to the junction with Cripple creek, and even at isolated places below this locality. Grouse mountain, with its phonolite cap, shows many prospects from which occasional good assays have been obtained; but neither here nor on Straub and Brind mountains has anything of permanent value been developed thus far. It is claimed that ore bodies of low grade, containing a few dollars per ton, exist.

The breccia caps of Mineral, Carbonate and Tenderfoot hills are dotted with prospect dumps, and even shafts several hundred feet deep. Nothing of permanent value is recorded from Mineral hill, though fairly productive placers have been worked at its southwestern base, almost in the town of Cripple Creek.

On Carbonate hill the Elkhorn has been a small producer; on Tenderfoot hill the Friday, Hoosier, Black Diamond and Mollie Kathleen contribute their parts to the production. Two miles north-northwest of Cripple Creek is the Galena mine, the vein of which follows for a part of its course a phonolite dike in granite and has a small output to its credit. About the same distance north of the city is the small volcanic center of Copper and Rhyolite mountains. At the former the Fluorine has produced \$160,000 and low-grade ore is now being cyanided. Prospects are found on Rhyolite mountain, and, in fact, all over the granite country between it and Trachyte mountain. The Lincoln mine, near Gillette, and several other prospects farther south, along a belt of phonolite dikes, have produced a little ore. It is claimed that there are low-grade veins on both sides of Bernard creek, northwest of Gillette, in a region of granite with occasional dikes and masses of phonolite. Trachyte mountain, southeast of Gillette, is covered by phonolite, and a little ore is occasionally found in veins at its southern foot. Some work has also been done on Cow mountain, about 4 miles northeast of Bull hill.

**CHARACTER OF THE ORES.**—The characteristic feature of Cripple Creek ores is the occurrence of the gold in combination with tellurium, chiefly as calaverite, but partly also as the more argentiferous sylvanite, and probably, to a minor extent, as other gold, silver and lead tellurides. The tellurides are frequently associated with auriferous and highly argentiferous tetrahedrite, with molybdenite, and occasionally with stibnite. While these minerals have not yet been closely studied, preliminary examination indicates that their contents in gold are due to an intimate mechanical mixture of tellurides. Pyrite, while widely disseminated through the country rock and of common occurrence in the fissures, is rarely sufficiently auriferous to constitute ore. Such of the pyritic ores as have been tested reveal the presence of tellurium, indicating the ore is a mixture of pyrite and gold-silver tellurides. Galena and sphalerite occur in small quantities in many of the mines, but rarely contain enough of the precious metals to form ore. Native gold appears to be absent from the telluride ores, except as it may be set free by the oxidation of these tellurides.

The usual gangue minerals of the ores are quartz, fluorite and dolomite. Roscoelite and rhodochrosite are also found in places. Celestite, or sulphate of strontium, while never present in large amount, frequently occurs as little acicular crystals in the quartz vugs of the lodges. Calcite occurs interstitially in much of the breccia near the ore bodies, but is rarely found in distinct crystalline form with the ore minerals. Secondary potassium feldspar is common in



the ores; it is especially abundant in the ores enclosed in granite, particularly those in the Pikes Peak type. This feldspar has the composition of orthoclase, or microcline, and is formed by the recrystallization of the original potassic feldspar contained in the rocks. In the granitic ores of the Stratton's Independence, Portland, Ajax and Elktou mines this secondary feldspar is the principal gangue mineral.

Oxidized ores, while still worked in many properties, are of relatively less importance than when Penrose described the district. The deep workings of the present day show that kaolin is always connected with oxidation and is not a product of the original mineralization of the district, as was supposed by Penrose.

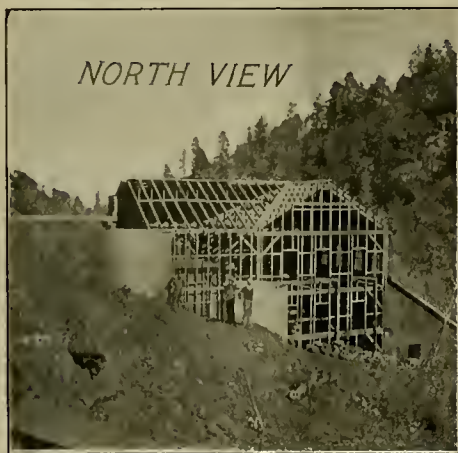
The Cripple Creek ores, as a rule, contain very little silver, the average proportion being about one ounce of silver to ten ounces of gold. In the Portland and Stratton's Independence mines the proportion is very much less, the silver from the Portland in 1901 amounting to only 2.4 ounces for each 100 ounces of gold.

The average value of the Cripple Creek ores lies probably between \$30 and \$40 per ton. In some of the larger mines the average value sinks to about \$25 per ton. From a lower economic limit of about \$12 per ton the values of individual shipments swing through a wide range up to ores carrying \$3000 or \$4000, or even \$8000, per ton. Occasionally smaller amounts—one or two tons—have yielded as much as \$50,000 per ton.

(TO BE CONTINUED.)

### New Mill at Poland, Ariz.

The Poland-American G. M. Co. have started their 100-ton mill at Poland, Ariz. This will work the ores of the Vassar, Fitzhugh Lee and Joe Wheeler claims, which produce a hard ore and a soft ore requiring different treatment. The hard ore is crushed with



stamps, the free gold caught on amalgamating plates and the sulphurets saved on Wilfleys and vanners. The soft ore is crushed with Colorado Iron Works rolls and then passed over Wilfleys and vanners into the drying rooms. C. J. George of Los Angeles, Cal., is president and general manager.

### Cinnabar in Arizona.

Recently the discovery of cinnabar, the sulphide of mercury, at Copper Basin, Arizona, has been announced in press dispatches. Cinnabar was discovered in some mining claims located 2 miles southwest of Copper Basin in 1890, and it is more than probable that the recent reported discovery is of the same occurrence. The original discovery was made by a man named McNeary, who lived near these claims. The occurrence is of more than ordinary interest, owing to the mineralogical association of the cinnabar.

It occurs in rhyolite, accompanying large pseudomorph crystals of hematite, after pyrite, an unusual occurrence of cinnabar. Evidently there was at one time a deposition of iron sulphide along a zone of fracture in the rhyolite, some of the sulphide assuming the form of groups of cubes up to an inch in diameter. These groups of pyritic cubes occurred in vug-like spaces or cavities, and were attached to the rhyolite walls of the cavity. Whether the cinnabar was deposited simultaneously with the pyrite or not is not apparent, but it now occurs mostly about the base of the groups of pyrite crystals, which have been completely altered to hematite, though still retaining the form of the original pyrite. Quartz and iron oxide and hematite are abundant in the zone of fracture, though the cinnabar occurs in relatively small amount. It was claimed the iron oxide contained gold, but as to this the writer is uncertain.

### Ancient Spanish Mine Workings.

Jos. McGillivray, the veteran hydraulic miner from Dawson, Y. T., who is spending the winter in California, tells of his experience some years ago near Astorga, Spain, where he had gone as consulting engineer for the Rothschilds, who were exploiting some placer ground in that region. Mr. McGillivray found that the gold gravel had been worked by the Romans when Iberia was a Roman province, centuries before the Christian era, and remains and traces of the ancient workings could be distinctly seen. With no knowledge of modern mining methods, in a country destitute of timber and dependent on slave labor, the work was necessarily crude; yet Pliny, the historian, records the annual production of 20,000 pounds of fine gold from those gold mines near Astorga under the Roman sway. The course of an ancient ditch 30 miles in length can be traced, and rock supports, in lieu of timbers, are still discernible. For "flumes" they cut channels in the slate and for "rifles" therein used a sort of heather, which was afterward collected and burned, the gold being as a residue in the ashes.

Mr. McGillivray found where an area of 10,000 acres had been worked over. A curious feature was the evident practice of a custom that, so far as hitherto supposed, originated at Canon Creek, Trinity county, Cal., viz., "booming." That unique form of using water in hydraulic mining is a way of making what would ordinarily be an insufficient flow of water do quick but not lasting work. The arrangement consists of an automatic reservoir of various sizes and shapes that collects all the water not run through the giants or monitors for, say, fifteen minutes, and then a valve automatically opens of sufficient size to allow all the water thus collected to escape in five minutes, thus obtaining the use of over 20,000 inches of water for five minutes that 2000 inches has furnished by caching it for fifteen minutes. That force of water will carry boulders weighing over 500 pounds through 1 mile of flume in five minutes. On the Boss & McClary placer mine, adjoining Trinity Center, Cal., the "shooter" box is 20x40x6 feet, with an automatic opening of 18 inches by 4 feet. They have a bedrock flume, 6 feet wide by 3 feet deep, nearly half a mile long, lined with 9-inch blocks.

It was in northern California that that style of hydraulic mining was supposed to have been first introduced, though something similar in operation was evidently used in the old days of ancient Rome. It is usually practiced only along California gulches. These affording little water, it became necessary that the limited supply be reservoired and properly distributed in order to make it effective in this method of gravel washing. The object is attained by retaining the water in dams and then releasing it suddenly, with a rush or boom. Near the bottom of the dam built for this purpose is left an aperture so large that, when opened, the water escapes rapidly. Placed on the top of the structure is a small race, through which the water flows when the dam is full, and is discharged into a large wooden box suspended from the end of the sweep, turning on a pivot, and the upper end of which extends to and over the top of the dam. Attached to this end of the sweep is a strip of heavy canvas, which, dropping in a fold over the aperture below, keeps it tightly closed when the dam is full. When this stage has been reached, the water flowing through the race into the wooden box mentioned soon fills it, causing this end of the sweep to sink and the other to rise, carrying with it the strip of canvas and uncovering the large aperture below, allowing the water to rush out. Meantime, the wooden box, having emptied itself through numerous small bores made for the purpose, this end of the sweep, relieved of its weight, rises and the other end drops. The canvas falls over the outletting aperture, closing it as before. Then the dam fills again to the brim and the operation as above is repeated. This plan for handling water is wholly automatic. It takes care of itself and goes on day and night, without any attention on the part of the miner, doing its work as long as the water lasts.

Some of the miners call it a "self-shooter." What term was applied to it by the old Roman miners Mr. McGillivray was unable to say.

### The Extralateral Right Law.

TO THE EDITOR:—Will Mr. John Stewart permit me to take issue with some of his remarks on the extralateral right law in your issue of December 31?

It is purely theory when Mr. Stewart says: "It is breaking of this law, 'Thou shalt not steal'—ore from your neighbor's claim—and not the just provision of the extralateral right that is at fault." A logical (?) argument indeed to say that!

If Mr. Stewart has seen many extralateral right lawsuits he has seen litigants on each side conscientious in belief that they have the apex; if Mr. S. has been underground he certainly must admit that he has been puzzled as to which outfit has the apex. This discovery before location is all very pretty but not always practicable.

Take Creede, Colo., when staked on the snow; this great camp covered with wash and no outcrop; claims piled about as though you threw packs of cards on a table. I hear Mr. Stewart say from his armchair, "Such locations are illegal, invalid, etc."

That's true. We know that. But let any man come in during a mining excitement and say that, or attempt to dispossess a man of title so founded. It means "bucking" the community. With development and patents, veins run "any old way" as regards claims; then come your extralateral right suits.

"If, if—" and then talk how claims ought to be located, is theory and does not remedy a condition. The extralateral right claim statute was passed when claims with outcrops were the rule. It is truly absurd, as any miner knows, to always tell easily which has the apex.

Does Mr. Stewart imagine any company would employ experts, the best legal talent, have maps and models made, and enter a contest that costs many thousands of dollars, if they knew they were wrong—would lose the suit, and their money; and have costs put on them, when all they have to do, according to Mr. Stewart, is to murmur "Thou shalt not steal" to their opponents and "We are right." Fudge! With equal honesty, the other side spends money for battle and says, "It is our ore, not yours." Then the fight is on for the apex that each chap, under this wonderful statute, thinks he owns.

"In course of every few years it has become fashionable for some ambitious lawyer or mining engineer to make the grand discovery, as did E. A. Belcher, that the extralateral right should be abolished," so Mr. Stewart tells us. Does he know a U. S. commission investigated this question almost thirty years ago and published a heavy report of investigations in camps, of litigation and of many eminent men and cost of useless litigation and recommended changes. It was a mighty able commission, Mr. Stewart, so do not throw stones at its becoming fashionable now by Mr. Belcher.

"There are more theories in this world, Horatio, than are dreamed of in your philosophy."

"The square location is also undesirable on account of its covering more leads or deposits than the vein or deposit which is subject of location."—Stewart.

Suppose it does. Does not many a mining claim now; does not a group of mining claims now, that one man may own?

"As a consequence, prospecting is prevented, or good mining ground is tied up, etc."—Stewart.

Is it tied up more than when patented, or where annual work is done? Certainly not.

"Hence it is that where the square location exists little prospecting and mining are done. It therefore stops industry in mining, and as industry is the secret of happiness among civilized people it is not a law nor condition which is for best interests."—Stewart.

Now from far and near, fellow miners, would not that medley of statements and morals at finish jar you?

For the first part of it, Mr. Stewart, how about Mexico and Australia? Some mining there, is there not? Production seems to indicate it. "Square" locations too; this location, which you say is a good farmers' boundary, prevails in Mexico and some other countries.

I mean it courteously when I say I question Mr. Stewart's ever having fought an apex suit or been a witness on one, nor having witnessed in person the staking of a new camp where there are no outcrops.

His idea of arbitration on the ground is very pretty. It could be done on surface boundaries, but if this beneficent act is so clear that "Thou shalt not steal" is the head and front of it, my dear Mr. Stewart, why the disputes ever, and need of your arbitration?

"Those who desire a change in the law as at present have good intentions, but they base their arguments on wrong premises."—Stewart.

I am grateful that we have "good intentions." The rest of the paragraph is merely a calm, self-satisfied statement, but no proof.

All Mr. Stewart's arguments smell of the lamp, of theory. The syllogisms are of college, of class room. The wielder of the pick, the carrier of the



transit, the prospector, the miner, who has been, who has seen, who is, seems absent.

"An experience of forty years' mining \* \* \* enables me to give facts on this important question for protecting the best interests of capital and labor invested in mining."—Stewart.

Methuselah was not the wisest man, I am sure, and we await facts. The extralateral right law is an ideality, a dream, but it certainly is not in its application. Thank Mr. Stewart for permitting my discussion.

RICHARD ROELOFS.

Cripple Creek, Colo., Jan. 14.

## Cyaniding Raw Pyrite.

TO THE EDITOR:—In "Concentrates" of December 24, 1904, appears a statement to the effect that the successful treatment of auriferous pyrites by direct cyanidation is dependent upon fine grinding; and that a material almost in the condition of slimes is necessary for the possibility of high extraction. This, however, is only partly true, for while fine grinding is very desirable in the treatment of raw sulphides by cyanide, it is not absolutely necessary, the factors, time of treatment and depth of charge, having been found in actual work to be of far more importance.

At a small plant installed some years ago by Wallace Macgregor near Johnsville, California, several thousand tons of fairly clean sulphide concentrates were successfully treated in the raw state by cyanidation. The material was in very widely different degrees of fineness owing to the use of different sized screens at different periods in the mill where the concentrates were produced, and also to the fact that a considerable part had been reground in amalgamating pans, with a partial recovery of gold as base bullion, to a fineness approaching that of slimes. The coarser material, which was mostly of a size similar to that produced in a stamp mill where ordinary 30-mesh slotted screens are in use, had been in part lying on the dump for several years, though still bright and containing no salts, while another portion had been but very recently mined by leasers. The finer product was for the most part badly weathered and introduced a problem in the matter of washing out the soluble sulphates, which came away with the first wash waters in the shape of a blood red liquor carrying small amounts of gold.

The first charge of coarse concentrates, about 5 feet in depth, was treated for seven days, when the extraction was found to be very unsatisfactory. Upon investigation it was found that while from the top few inches of the charge a high percentage of the gold had been extracted, a little deeper down this was much decreased, until toward the bottom no extraction whatever had taken place. Apparently the reason for this was that the oxygen necessary for the solution of the gold was absorbed by the sulphides, though it is possible that something in the nature of a reprecipitation or weakening of the solution as it percolated downward influenced the result.

Further experiments on this coarse material showed that with a charge 20 inches in depth an extraction of between 85% and 90% could be obtained with a thirty-day treatment consisting of fresh "five-pound" solution every twelve hours. This extraction being considered satisfactory on the grade of the material, the entire dump was treated on the same plan, though in the case of the finer reground stuff a satisfactory extraction could be obtained in twenty days time.

A unique state of affairs occurred occasionally in the treatment of some of the fine material which was very badly oxidized, the extraction taking place in a much shorter time—about fifteen days—and with the solution all the time slightly acid to the litmus or phenolphthalein tests. When these charges were found to be "bad ones," they were carefully watched as to precipitation of the gold, and the number of gold and the number of "doses" of solution lessened to save cyanide. The acidity in these cases was due to salts insoluble in the preliminary water washing, and the rapidity of the solution of the gold due possibly to the action of nascent hydrocyanic acid, but probably to the more free condition of the gold. The gold left in the residues was found to consist for the most part of comparatively coarse inclosed particles as was shown by pulverizing and panning.

Experiments were tried in the direction of using a warm solution, agitation, and sodium peroxide to hasten extraction of the gold. The two first, while somewhat beneficial, were not used because, primarily, the initial cost of installing suitable apparatus was not warranted with the small definite amount of material to be treated. Sodium peroxide was used to a considerable extent, for while it did not accelerate the extraction of the gold very materially, it was found that an increase in the amount of silver extracted more than paid for its use.

Care as to the ordinary rules of cyaniding apply in the case of treating sulphides in the same way as to other ores. The effect of organic matter in precipitating or preventing the solution of gold, for example, is a matter upon which very little stress has been laid, and the use of a mixture of asphalt and coal tar is even recommended in some of the common

hand books on the cyanide process as a substitute for P. & B. paint. The result of using coal tar inside the tanks is of course disastrous, for extraction practically ceases as soon as enough of the organic matter is dissolved by the solution. Two cases of this kind have come under my notice in California, but as both were very small plants and were both destined to close down very shortly for lack of material, the defect was never remedied. In one of the large dry crushing plants in Utah a similar case occurred, but in a different way. As cold weather approached, the superintendent had a large stove placed in about the center of the tank room with a T overhead and long lines of stove pipe extending above the tanks to each side of the building. An oily distillation product from the coal used in the stove soon condensed in sufficient quantities to drip from each joint of the pipe into the tanks. Extraction of gold soon stopped, but as the property went into the hands of a receiver a few days later for other reasons, the cause was never investigated.

To return, however, to the sulphides, the advisability of cyaniding concentrates in the raw state, or to roast and cyanide, to roast and chlorinate, or to ship to the smelter, is a question to be decided by a variety of considerations, such as the amount of material to be treated, distance from smelter, value of material, cost of roasting, etc. Such points as the percentage extraction, time of treatment, consumption of cyanide, etc., can be readily determined by a little preliminary laboratory work and with a fair degree of accuracy. In the high grade pyrites of the Mother Lode district of California the gold may be enclosed in such a way as to require extremely fine grinding for direct cyanide treatment, but the process as outlined above has been successfully used in several sections other than the one mentioned on concentrates as received from the mill.

The great drawback is, of course, the necessity of large tank capacity and floor space to secure a satisfactory daily tonnage, but in those sections where an out-of-door plant is not precluded by climatic conditions this consideration is less serious. The shallow charge is, I have reason to believe, a point which has not received in this country the consideration of which it is worthy in the designing of large plants for difficult direct cyaniding ores.

R. C. HARRISON.

Cromberg, Cal., Jan. 9.

## Methods of Assaying Gold Telluride Ores.

Mining men in certain districts of the United States will be interested in Bulletin No. 253 of the United States Geological Survey, in which the subject of inquiry is the accuracy of the crucible assay method for telluride gold ores. The main point definitely established is the fact that the doubts which have been entertained as to the accuracy of the dry method are not well founded. It is clearly determined that the fire assay by crucible for gold telluride ores gives results which are quite equal to those obtained by the wet method, provided due corrections are made for slag and cupel losses.

The gold loss in the slag is very small, but the cupel losses are very appreciable. The cupellation loss of gold by volatilization is generally slight as compared with that by absorption. At a temperature which allows the formation of abundant feather litharge, the volatilization is negligible, or is perhaps compensated by retention of lead. The case is otherwise, however, at high temperatures, as the volatilization may then average one-half of that by absorption in the case of a quartation alloy. The loss of gold by absorption is very important, and is influenced far more than is generally supposed by slight changes in temperature. It is greater with pure gold and alloys poor in silver than with alloys rich in silver.

The experiments of W. F. Hillebrand and E. T. Allen, the authors of the bulletin, failed absolutely to show the need for a higher temperature at the end of cupellation with gold beads than with those of silver. The most exact results were obtained when feather litharge was still abundant at the time of brightening. Furthermore, it is altogether unnecessary to have gold beads in the muffle for some time after brightening to remove the last of the lead, for there is no loss in weight from so doing, but, if anything, a very slight tendency to increase. The results on absorption, as influenced by the amount of lead used in cupellation, were inconclusive. The error caused by the retention of lead in the beads is serious, if the results of two careful tests are to be depended on, which show 0.30% and 0.37% of lead. The amount of this retention is not lessened by leaving the beads in the muffle for some time after brightening.

Silver can be completely extracted from quartation alloys by nitric acid; but more than two repetitions of the acid treatment and subsequent washing are called for, if any certainty of complete extraction is to be expected.

Tests made with mixtures of pure nitrous and nitric acids show that the solvent action of the nitric

acid is so slight, if indeed there is any at all, that it need not be considered as a possible disturbing factor in parting. It was similarly shown that the losses in parting with pure nitric acid, whether traces of gold really dissolve or not, may be ignored, in an ore assay, at least.

This bulletin, which is entitled "Comparison of a Wet and Crucible-Fire Methods for the Assay of Gold Telluride Ores, With Notes on the Errors Occurring in the Operations of Fire Assay and Parting," is among the Survey's free publications. It may be obtained on application to the Director of the U. S. Geological Survey, Washington, D. C.

## THE PROSPECTOR.

Nothing so stimulates a prospector as a rich strike. When some fortunate searcher finds rock matted with gold, each receives a new supply of energy, and, with renewed confidence in his own ability and luck, strikes out once more in the quest of other bonanzas as yet unknown. The development of the West owes a great debt to the prospector, for without him the discovery of new mineral regions would be of rare occurrence. He is the pioneer who penetrates the mountain fastness and who with his patient burro plods wearily over the cactus-strewn sands of the desert, where the heat radiation of a summer's day gives everything a metallic glare, and no one but a prospector would remain if not compelled to. The winter is the time for the prospector in the desert regions of the Southwest, and in summer he can be found wending his lonesome way amid the peaks and crags of the mountains. The events of the past year have abundantly shown that the old-time prospector, who was declared to be passing away, is only succeeded by a younger generation of his genus, who, with a determination equal to that of his predecessor of former years, but with a broader knowledge of his craft, has taken up the good work, who seeks not less industriously, but more intelligently, for the veins and deposits, the finding of which he believes will mean a fortune to him. Often his efforts are vain, and again he is more fortunate and discovers a mine; but mines are made, and he often sells out before its great value is proven. The old-time prospector was a giant in his day, but he was more apt to be controlled by prejudice than his more modern prototype, who has learned to neglect nothing, to test anything that looks like mineral and to "locate it" should it offer sufficient promise. An instance of this may be noted in western Arizona, where a few miles from Fort Mojave the Moss mine was discovered and worked over forty years ago; but the rich veins of Gold Roads and others of that vicinity were entirely overlooked, though outcropping boldly on the mountain side. The prospector is becoming broader in his knowledge and in his methods, but he has much that is of value to him still to learn.

The mineral specimens from Austin, Oregon, are grano-diorite in greater or less stages of alteration. The country, judging from the description accompanying the rocks and from the specimens themselves, is sheeted—traversed by a great number of parallel fissures, due to pressure. Into this sheeted zone waters have penetrated and affected the normal rock by removing some constituents and depositing others. Nos. 1, 2 and 4 are evidently from the same magma. No. 1 shows abundant quartz with plagioclase phenocrysts in a feldspathic mass, probably largely orthoclase. Hornblende is present, but not abundant. No. 2 is very similar to No. 1. It shows a little pyrite. No. 4 is also like Nos. 1 and 2, but contains less plagioclase and more pyrite than No. 2, which in places the hornblende is being replaced by pyrite, an interesting occurrence, and one which often accounts for the appearance of gold in granitic rocks. No. 3 is somewhat different from the others and is apparently a dike in the grano-diorite. It is somewhat coarser in texture than the others and is the only one of the lot showing mica (biotite), excepting No. 5, which is otherwise almost identical with No. 1. No. 6 is a small vein of quartz and calcite, with pyrite and probably also gold, formed in a favorable place where there has been an open seam or a crushed layer of the original rock. Albite is a variety of plagioclase—a sodium aluminum silicate. Aplites are a variety of granite occurring in dikes, of uniform grain composed of quartz and feldspar, but no hornblende or mica, or only a little greenish-white mica. The dikes may be of the width of a fraction of an inch or may be 100 feet wide or more. Often altered and silicified, it presents the appearance of quartzite.

The mineral specimens from Ibapah, Utah, are: No. 1. Limonite (iron oxide) pseudomorph after pyrite. That is, these crystals were originally pyrite (iron sulphide) and were changed by oxidation to iron oxide. These are of very common occurrence and of no particular value. Occasionally crystals of this character are gold bearing. In fact, if the original pyrite was auriferous the limonite would be also. No. 2 is volcanic ash. No. 3 is quartz with arsenical iron sulphide (mispickel). The greenish stain is due to slight alteration of the original mineral.



# Methods of Renewing Old Timbering at the Dives-Pelican Mine, Silver Plume, Colo.

Written by J. F. McCLELLAND.

The Dives-Pelican mine is one of the oldest in Clear Creek county, having been in operation almost continuously for more than thirty years. In its early history the high cost of labor, transportation, supplies, etc., made it impossible to mine at a profit any but high-grade deposits of ore. Practically the same policy has been followed up to the present time, with the results that the old stopes contain large quantities of ore of too low grade to ship directly to the smelter. Recently there has been a combination of several properties and it is proposed to make the ore in the old stopes the basis of large-scale mining operations.

Many of the old workings have been abandoned for a long time and have caved in. In most cases the drifts were driven in a soft porphyry, which swells

the walls of the drifts require support. They are rarely strong enough to carry stulls and the stopes are supported in most cases by ordinary three-quarter sets. The standard set, with its dimensions and framing, is shown in Fig. 1. Round timber is used exclusively and is mostly native spruce obtained in the vicinity of Silver Plume. The posts of the sets are usually 10 inches and the caps 12 inches in diameter. No sills are used. The posts are either braced to the track, as shown in Fig. 1, or else the feet are kept apart by a 6-inch timber spiked in place on a level with the ties and extending clear across the drift. The sets are lagged with poles from 4 inches to 6 inches in diameter. The side lagging is placed as shown in Fig. 15, and the space behind the pieces filled with broken rock. The timber in the main sets has an average life of from four to six years, but the lagging does not last as long as this. The pressure of the walls and the overlying ore is made evident by the fact that old drifts which are still open are from 6 inches to 1 foot lower and narrower than they were originally.

Before an old set can be taken out the lagging around it and on each side of it must be replaced. At the same time the drift is restored to its original cross section. The lagging is replaced one stick at a time, beginning with that in the roof. Usually the weakest of the old poles is pulled down first—with a pick or bar. Some broken rock will fall at the same time, but generally there are enough large lumps of ore in the stope above to wedge and hold for a short time. If necessary, the hole made in this way is enlarged with a gad and a new lagging pole is inserted, resting at one end on top of the lagging of the set last replaced, and at the other on short blocks set on the caps of the old set (P, Fig. 15). The adjoining lagging pole is then pulled down and replaced in the same manner, the process being repeated until the whole roof has been relagged. This method of putting in the lagging gives the completed work a peculiar appearance, as the lagging poles are inclined downwards instead of upwards, as is ordinarily the case.

The side lagging is taken out and renewed in a similar way. As a general rule, this work begins at the top and proceeds downward, but the presence of fissures and loose slabs of rock may reverse this order. Much work with a gad is usually necessary to get sufficient room to set the side lagging far enough back so that they will take a new set. The forward ends of these lagging poles are blocked against the old set, as shown in Fig. 3.

When new lagging poles have been put in place all around the drift, a false set (Figs. 2 and 15) is erected about 6 inches behind the old set. This is a three-quarter set, made of 6-inch timber, with its outside dimensions slightly greater than those of the standard set. The posts are sunk in hitches 6 or 8 inches deep and are braced to the track. This set is also braced back to the last new set to prevent its overturning under pressure (Fig. 15). The false set is used over and over again, and, for convenience in erection and removal, a false cap (r, Figs. 2 and 15) is used to brace the heads and posts apart, instead of the notch used in the regular set. If the work is carried out properly the cap of the false set fits snugly against the new top lagging and the posts are driven into place with a sledge. If the top lagging poles are too low they may often be raised by putting a drill column under the cap of the false set and using it as a jackscrew. The drill column is of great service also in placing the timbers of the main sets and for many other purposes.

The side lagging is then wedged firmly against the posts of the false set, and the lagging in front of the old set is replaced in exactly the same manner as described above. The rear ends of the side lagging poles, however, must be caught by the posts of the false set, as shown in Fig. 15, so that these lagging poles are cut longer than would otherwise be necessary.

When this has been completed the old set is knocked out and the new one erected in its proper position. The side lagging is then driven ahead to a firm bearing on the new set, and the false set is removed. The same cycle of operations is repeated to renew the next set.

The details of carrying out this work are varied to meet different conditions, as, for instance, in replacing half sets instead of three-quarter sets. Where the ends of the lagging butt on top of the cap instead of overlapping, two false sets are necessary, one on each side of the old set, but otherwise the operations are the same.

A timberman and his helper will average about one set per day of eight hours. The cost of this work per set replaced is approximately as follows:

Timberman .....	\$2 75
Helper .....	2 50
Timber (including framing) .....	4 00
Tramming, mucking, etc. ....	70
Total .....	\$9 95

Since the sets are 4 feet 8 inches apart, the cost is about \$2.15 per foot of drift retimbered.

Quite a little broken rock and ore will fall into the drift in doing this kind of timbering. This is often a convenience, since it gives the men something to stand on while replacing the back lagging. Its amount varies greatly with the character of the

material encountered, but with careful work under ordinary conditions it should not exceed three tons per set. Part of this broken material is used as a filling behind the side lagging.

(TO BE CONTINUED.)

## Charcoal Burning.

In mining regions charcoal is a very useful material and in some things is absolutely necessary. It is useful in the blacksmith shop and in the assay office, and in some camps is used extensively in smelting operations. The following, from Fuel, gives a good description of the art of burning charcoal and will possibly prove valuable to those who care to burn small pits for their own use or for the market:

The best site for a kiln is one that has been used before—the ground is thoroughly dry and is covered with absorptive charcoal dust. The kiln usually consists of two tiers of wood, one upon the other, placed as straight up as possible, the smaller pieces inside, the thicker pieces in the center and the smaller pieces again toward the outside. When two stories have been piled up in this way, more wood is laid horizontally across the narrow top. This kiln is gradually shaped like a dome. All openings are then carefully filled in, in order to prevent unnecessary drafts, and the whole is made as firm as possible.

A passage is now constructed from the outside of the kiln to the flue in the center, or a log of wood which has been placed previously in position is drawn from under the bottom tier, leaving a hollow kindling passage, in which, when the kiln is completed, a torch may be inserted to set fire to the shavings. An important work is the covering of the kiln. Supports of various kinds are placed in position to save a relapse under the weight of the coverings, of which there is both an inner and an outer. The kiln is first tiled, as it were, with thin sods, overlapping each other. Then the outer covering is applied, consisting of loamy forest soil and charcoal dust, well mixed and firm enough to exclude air and retain the heat, and at the same time soft enough to allow steam to escape, and to yield without cracking, as the kiln gradually sinks during the burning. A windbreak is constructed, if necessary.

Early in the morning, when the air is still, a torch of pine is inserted in the passage before mentioned, and the flames seize hold of the dry twigs and shavings in the flue. At first, when the dome becomes hot, steam and thick smoke arise from the top; if it all is well, the smoke should give way to flame, and a not unpleasant, pungent odor should be noticeable. This is a sign that carbonization is in progress. After a few hours charcoal will form in the dome, which will gradually sink in.

Should the sinking be irregular, it is a sign to the charcoal burner that the kiln is burning unevenly. There is too much draft from one quarter, or too little in another; or some of the wood in the kiln is burning quicker than other pieces. This state of affairs must be remedied by boring draft holes or applying water, as the case may require.

On the second day after kindling the first vent holes are made. These holes, bored through both coverings down to the wood, in two rows to leeward, help to regulate the burning, and also give indication when the carbonizing process nears completion. At first smoke and steam issue through them, and after a while the smoke turns blue, which is a sure and certain sign that the charcoal is burning, and this, of course, is the last thing the charcoal burners desire. The holes must be closed immediately with soil or turf and a fresh row opened lower down the side.

## A Need for Legislation.

TO THE EDITOR:—In preceding numbers of this paper the unfortunate trend of the California law of underground waters, hostile to mining interests, was pointed out. In the desire to protect farmers in the arid southern parts of the State, a rule has been adopted which threatens to put the drainage of mines under heavy restrictions. To the authorities cited can be added another, which has since reached my attention (99 Am. St. Rep. 79, note), wherein the writer thinks legitimate and ordinary mining may be no defense under the recent decisions, if the water that seeps into a mine comes from neighboring agricultural land, as it is so likely to do. The question is still young, and something should be done to prevent the law settling itself in that form.

In the present session of the California Legislature the civil code will in all probability be revised, under the constitutional amendment adopted at the last election. Some provision could be inserted that would cover this, and provide that mining in the ordinary way, and all work naturally incident thereto, done primarily for the purpose of extracting valuable mineral deposits, is lawful, and may be carried on without liability for diminution of water supply caused thereby on other lands.

Such a provision would certainly be timely. It would avoid much doubt and litigation, and protect

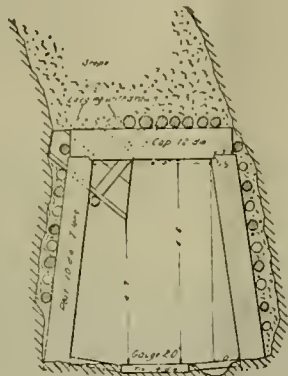


FIG. 1.

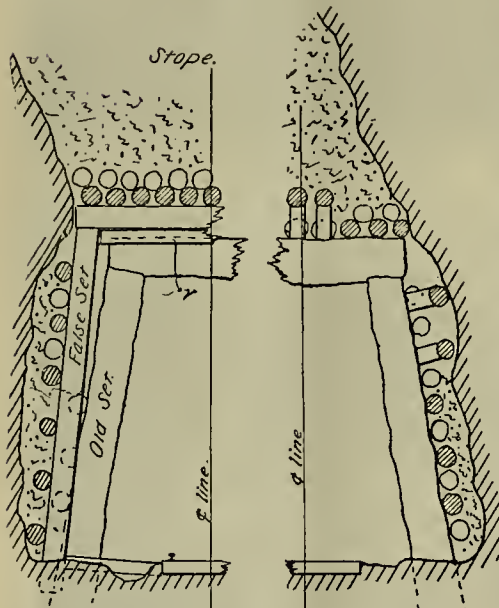


FIG. 2.

FIG. 3.

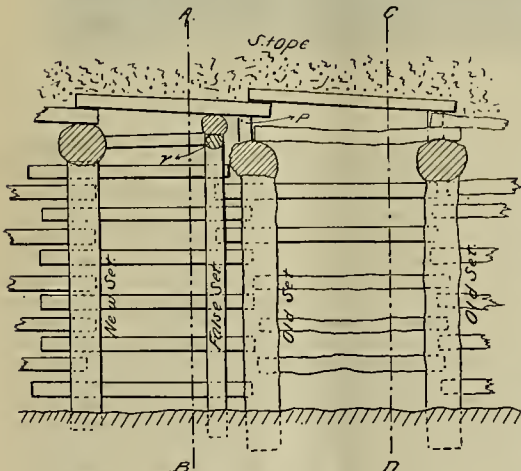


FIG. 15.

and shells off on exposure to the air, making it necessary to support the walls as well as the back of the drift. Much preliminary work, in the nature of reopening and retimbering the old workings, has been necessary before actual mining operations could begin, and this work seems unusual and interesting enough to warrant its description.

RETIMBERING OLD DRIFTS.—As mentioned above,

\*Abstract School of Mines Quarterly.



one of the most important industries of the State. To leave the law in doubt would mean lawsuits until it is settled. To settle it the other way would mean more lawsuits still. The extralateral right to veins has been such a fruitful source of litigation that there is now much discussion over the advisability of giving it up. The new law of underground waters has itself features not unlike giving the farmer an extralateral right to underground water, with much of the uncertainty that follows whenever underground rights are recognized and not limited by surface boundaries.

If the civil code is to be revised, the influence of your readers and of mining interests in general might well demand some provision such as suggested above.

SAMUEL C. WIEL.

San Francisco, Cal., Jan. 16.

## The Genesis of the Copper Deposits of Clifton-Morenci, Arizona.\*

NUMBER IV.—CONCLUDED.

Written by WALDEMAR LINDGREN.

THE CORONADO TYPE OF VEINS.—Almost the only representative of the Coronado type of veins is that

hardly conclusive. It seems as if the dike had been intruded during the epoch of faulting, and the solutions depositing the copper certainly followed the intrusion of the dike.

**GOLD-BEARING VEINS.**—Gold, silver and lead are practically absent from the principal deposits, but it is an interesting fact that they begin to appear in many of the outlying veins somewhat distant from the central mass of porphyry. These veins, in which copper is apt to play a less important part, have not as yet attained much importance from an economic standpoint.

**CONDITIONS OF GROUND WATER.**—Permanent water has not thus far been encountered in any of the mines in the whole district with which this report deals. Morenci is situated on the hills from 800 to 1500 feet above the principal streams, Chase creek and Eagle creek, and the deepest workings in no place reach farther than 600 feet below the surface. A little seepage from the surface takes place in case of heavy rains, or from the local water supply, and some drifts and crosscuts underneath the town are somewhat damp, especially in the Manganese Blue and Arizona Central mines. The mines at Metcalf are situated on Shannon mountain from 500 to 1200 feet above Chase creek, and here, too, the workings are dry excepting one place in the Shirley tunnel

other hand, the altered limestones and shales are very compact, non-porous and impervious. Where circulation was facilitated by fissures, as in the Manganese Blue and the Joy mines, the rocks may be partly oxidized to a depth of 400 feet, but this is generally a maximum. There is no well-defined plane expressing the depth of oxidation which, on the contrary, proceeds extremely capriciously, entirely fresh sulphides being frequently found very close to the surface.

**SUMMARY OF GENESIS.**—The intrusions of stocks and dikes of granite-porphyry and quartz-monzonite porphyry, which took place in late Cretaceous, or early Tertiary times, produced an important contact-metamorphism in shales and limestones of Paleozoic age, which happened to adjoin them. This metamorphism resulted in metasomatic development of garnet, epidote, diopside, and other silicates, accompanied by pyrite, magnetite, chalcocite and zinc blende. The sulphides are not later introductions, but contemporaneous with the other contact minerals.

The contact zone received substantial additions of oxides of iron, silica, sulphur, copper and zinc, enough to form good sized deposits of pure magnetite and low-grade deposits of chalcocite and zinc blende, all of which are entirely unknown in the sedimentary series away from the porphyry.



Town of Morenci, Ariz. Smelter on the Right.



Metcalf, Ariz. Arizona Copper Co.'s Works in Center.

of the Coronado lode, which crops on the summit of Coronado ridge about 2000 feet above Metcalf. It presents the unusual feature of a fissure vein following one of the principal faults of the district with a throw ranging from 1000 to 2000 feet, and it is traceable for nearly 2 miles, finally disappearing towards the west under the basaltic foothills of Eagle creek. The fault zone, which is from 50 to 200 feet wide, is followed by a diabase dike which has been crushed and partly deformed. Oxidized ores, malachite, azurite and chrysocolla, of medium to poor grade, occupy irregular shoots in the surface zone, but are replaced at a depth of from 200 to 300 feet by chalcocite ores. At some points the latter, however, reached the surface. Explorations during the last two years are reported to have developed large bodies of these, even at a depth of 500 feet below the surface. The evidence—as far as it goes—here, too, points to secondary origin of chalcocite and its derivation from pyritic ores, but here, as well as at Morenci, the maximum depth attained by the secondary chalcocite has not been fully demonstrated.

The Coronado lode is formed later than the Morenci type of veins and subsequently to the intrusion of diabase, which is younger than the porphyries of Morenci and Metcalf. Regarding the relative age of the diabase and the fault fissure, the evidence is

where a winze struck some standing water. The few shafts and prospects sunk in the bottom of Chase creek are the only places containing permanent water. The Copper King mine, situated a few hundred feet below the summit of the mountain of the same name, has a shaft 600 feet deep, and in it some crevices containing water have been found which soon drained out and no more has since come in.

The present stand of the water level, except along the creeks, is practically unknown. It probably rises as a slightly curved surface from the creek levels in towards the high hills. The total amount of water stored below this water level is probably small.

**DEPTH OF OXIDIZED ZONE.**—The presence of products of direct or indirect oxidation shows the depth to which oxidizing waters or the sulphate solutions have penetrated; but the porphyry and the metamorphosed limestones should be separated, because they act very differently. In that part of Copper mountain which has been explored, the average depth of the lower limit of the chalcocite zone is 400 feet, but it increases in places to 500 or even 600 feet. To this depth from the surface the sulphate solutions descended, and along important fissures they may have gone somewhat further. But the solutions not only followed fissures, but penetrated the porous, sericitized porphyry with considerable ease. On the

In view of the evidence, I consider it impossible that circulating atmospheric waters have effected these changes. The occurrences of metamorphosed rocks are manifold and found under many varying conditions; there is only one common factor and that is the presence of the porphyry. It is shown that the porphyry-magma contained much water which held dissolved various salts, among them some of the heavy metals. Sodium chloride and ferric oxide probably predominated. I believe that it contained all of the substances mentioned above, and that large quantities of this gaseous solution (for the critical temperature must have been exceeded) dissolved in the magma were suddenly released by diminution of pressure as the magma reached higher levels and forced through the adjoining sedimentary beds, the purest and most granular limestones suffering the most far-reaching alteration and receiving the greatest additions of substance. It is thus held that a direct transfer of material from cooling magma to adjacent sediments took place. The formation of garnet indicates large gains of ferric oxide and silica. If the magmatic waters carried iron only as ferric oxide some of it must have been reduced to magnetite during the metamorphism, for the latter mineral is much more common than the specularite. These contact-metamorphic deposits often occur at the immediate contact of the main porphyry stock and the

\*Abstract Trans. Am. Inst. Min. Engs.



limestones. But more commonly they seem to be connected with dikes of the same porphyry close to the principal mass, these dikes being probably more highly charged with magmatic waters.

It is shown that fissures and extensive shattering developed both in porphyry and altered sediments after the congealing of the magma, and that these fissures and seams were cemented by quartz, pyrite, chalcocite and zinc blende, forming normal veins largely of the type of replacement veins. The amount of copper contained in these is usually small, though in places possibly large enough to form pay ore. The bulk of the veins consists of pyrite. Two classes of veins may be distinguished. The usual type is practically always connected with granite-porphry or quartz-monzonite porphyry recurring in this rock or along dikes of the same. The smaller division consists of those connected in their occurrence with diabase dikes. The genesis of the former type will first be discussed.

As far as the metallic minerals are concerned there is a striking similarity between the veins connected with porphyry and the contact-metamorphic deposits, the only difference being in the magnetite, which does not occur in the veins proper and only subordinately in certain of the altered wall rocks. A relationship is also clearly seen in the remarkable action of the vein solutions on the adjoining wall rock wherever this is limestone, tremolite and diopside being formed in it by replacement. On the whole, iron and silica are the main substances added, during con-

the eruption of the Tertiary basalts and rhyolites. Oxidation thus acted on them for a very long period.

The irregular and tabular deposits in limestone and shale have obtained their present form, partly by direct oxidation and partly by the influence of sulphate solutions derived from the disseminated chalcocite due to contact-metamorphism; a great enrichment has taken place, due to decrease of volume and addition of copper from the circulating sulphate solutions. Some of the oxidized deposits in shale, however, may be wholly due to absorption, exerted by the kaolin in the shale on these sulphate solutions.

In practically all of the veins, the surface zone of poor ore is due to the direct oxidation of chalcocite. The solutions from this part descend and add richness to the upper part of the remaining chalcocite zone. But at the present low stand of the water level and the exceedingly dry climate, the lower limit of the chalcocite zone is probably almost stationary.

The copper deposits of Clifton and Morenci are thus believed to have been formed primarily by mineral-laden magmatic waters, partly acting as gas and partly as liquids, and in both cases derived from a magma of granite-porphry. These solutions were evidently directly released from the magma without a preliminary concentration in pegmatitic or aplitic dikes, which, indeed, do not occur in this district in association with the porphyry. It is perhaps superfluous to emphasize that these conclusions are not generalizations, and that this mode of origin is not necessarily that of all other metalliferous veins.



Detroit Copper Co.'s Concentrator, Morenci, Ariz.

tact-metamorphism, as well as during the vein formation.

As to the depth at which the deposition took place, no possible evidence is available on account of lack of data concerning the extent of erosion. But from stratigraphic consideration, it is not likely that the depth from surface was more than 2000 or 3000 feet. The cause of the deposition was no doubt a decrease in temperature, just as the deposits are formed in the cooled fluid inclusions. I think it likely that, in most cases, the solutions were present as liquids, for, assuming that the waters communicated with the surface, neither pressure nor temperature could have been high enough to reach the critical point.

The veins connected with diabase dikes are few in number, and the opportunity for their study has been limited. It seems risky, therefore, to express a definite opinion on their genesis, except that the copper and iron sulphide in all probability were derived from the diabase itself, either by means of magmatic or heated atmospheric waters.

The deposits thus far described are, in general, of low grade, only rarely containing enough copper to be classed as economically important. Those in shale or limestone consist of disseminated sulphides, in places irregularly concentrated, or accumulated along certain strata, according to the well-defined tendency of contact-metamorphism. Those in porphyry consisted of heavy veins of pyrite and a small amount of other sulphides, surrounded by zones of dissemination of the same sulphides.

It remained for the surface waters, as erosion gradually exposed the deposits, to alter and enrich them in manifold forms.

From the evidence presented above, it must be concluded that some of the deposits, especially the fissure veins, were laid bare by erosion, and attacked by surface waters at an early date, probably before the principal faulting movement, and certainly before

The earlier processes of magmatic origin produced low-grade deposits of pyritic ores, and the final concentration to payable ore bodies has chiefly been effected by descending and oxidizing surface waters of atmospheric origin.

### Electroplated Copper Plates in the Battery.\*

Written by F. W. CINDELL.

The system of using silver-coated plates as an aid to extraction of gold by amalgamation was introduced on the Homestake G. M. Co. of Lead, S. D., by T. J. Grier, general manager of the company. As stated in a recent paper by C. W. Merrill on "The Metallurgy of the Homestake Ore," the Homestake ore is a "hornblende, garnetiferous schist or slate, which has been crushed and infiltrated with free silica and pyrites, the latter being about 5% or 8% of the ore, and comprising pyrite, pyrrhotite and traces only of chalcocite and arsenopyrite." The company has 1000 900-pound stamps, dropping 10½ inches eighty-eight times a minute with a 10-inch discharge, and crushing about four tons of rock per stamp per twenty-four hours. A No. 8 steel needle (.022 inch diameter) slot screen is used, equivalent to about a 1024 mesh-woven wire screen. On one side of the chuck block is fastened a copper plate, which is the only amalgamating plate in the mortar, and is dressed once in twenty-four hours. Mercury is fed into the mortar boxes. Each outside plate is 4½ feet by 12 feet, there being four rows throughout the mill—that is, there is one copper plate and three electro-silver-plated copper plates for each battery.

The life of the electro-plating on a copper plate

depends on the thickness of the plating, the tonnage crushed, fineness and character of ore, the quantity of water and velocity of flow, inclination of plate, the care the plate receives at the hands of the dresser, and the kind of tools used, while perhaps other influences are exerted which affect its longevity. These plates are also dressed once in twenty-four hours, care being taken to remove the least possible quantity of the plating. Two ounces of silver per square foot is the thickness of the plating, and under ordinary conditions their life may be placed at two years. The position of these plates makes little difference, for in some cases they are not in the mill at all, and do just as well, perhaps better, as they are then not subjected to that terrific vibration which we all know is anything but an aid to amalgamation. In a 200-stamp mill there are 160 plates with an amalgamated surface of 8640 square feet.

In the mills of the Rand with, perhaps, one exception, it is the practice to have but one row of plates, 5 feet by 12 feet, with an area of 2400 square feet in a battery of 200 stamps. Now, compare this figure with the former case, and you get a difference of 6200 square feet. In answer to this it may be said that on the Rand 95% or even 100% of the free or amalgamable gold is recovered on the single plate, and why incur the necessity of increased plate area with extra cost of installment, labor and maintenance.

The percentage of extraction I will deal with later on, but first let me say a word or two in regard to the practicability of the system. No doubt some millmen will scout the idea, and, in fact, in the February Journal of this Society I. Roskelley says: "I do not see that anything would be gained by putting another plate outside the mill." I do not agree with Mr. Roskelley, and will try to prove that he is wrong. The adherence of mercury to gold is a physical mixture of metals, pure and simple. Say it takes the pulp four seconds to pass from one end of the plate to the other; now, if this same pulp is subjected to the same process for a period of sixteen seconds instead of four, is not there a chance of its giving up still more of its values? Theoretically it should, and practically it has been proven. For example, at the Ferreira mine there is a second shaking plate, and P. Carter's contribution in the May Journal proves its value. I do not say that additional plates will catch much free gold, but I do contend they will hold that part of the pyrites, which is barely amalgamable, and has not been caught on the first plate. The additional area of 162 square feet of plate surface to the battery greatly increases the chance of catching what is thought to be non-amalgamable gold.

Mr. Carter also says that two-thirds of the amalgam caught on his second row of plates is from "black sand." The results obtained by him seem to me to be ample proof of the value of these plates, and since Mr. Carter has made a step in the right direction, I should like to see him go still further. I am sure we would watch with interest the results.

The mere suggestion of a third plate would, I presume, receive from most millmen even less approval than does a second plate. The following figures, however, show what has been done by this system. In June, 1902, the Homestake Co. saved on the silver plates alone \$51,333 worth of gold, exclusive of the amalgam and gold-bearing mercury obtained from the launders at the foot of the plates; and in 1903 \$51,672 worth of the precious metal was recovered.

Of the total amount of amalgam obtained—

	Per Cent.
Caught in the mortar box.....	35
Caught on the first row of plates.....	39
Caught on the second row of plates.....	13
Caught on the third row of plates.....	7
Caught on the fourth row of plates.....	6

The amalgam recovered from the lower plates contains a less percentage of gold than that from the upper plates. There is a great variation in the fineness of the bullion between the mortar and fourth plate—

	Fine.
Mortar box and inside plates.....	820
First row.....	810
Second row.....	556
Third row.....	550
Fourth row.....	495

The composition of the ore in question is, roughly, 6% pyrites, 55% silica, and the balance slate. In the Rand ore, approximately, 97% is silica and 3% pyrites. The gold in both is free, and in the pyrites.

The silica is not a very great factor in regard to extraction, as it gives up its gold freely—the pyrites is where the difficulty lies, and it is to this I wish to draw your attention. It seems to me there is not enough difference in the pyrites of the ores to warrant the non-practicability of additional plates in the treatment of Rand blanket, and if the system works well in one case it ought to give proportional results in the other.

The 10-inch discharge, as used by the Homestake Co., is responsible for the great degree of fineness to which the ore is crushed, 78% of the issuing particles passing a 10,000-mesh screen.

I shall not give here the method of electroplating; cost, time required, current, chemicals and mechanical devices used, as that would make a paper by itself.

The principal features of the working conditions described which I wish to emphasize are—(1) the fine crushing, (2) percentage of extraction, and (3) system of plates.

I hope these few remarks will bring forth from the

\* Abstract Jour. Chem. and Met. Soc., S. A.



millmen of this society due criticism, which may be the means of further experiments in this direction. When it has been proven whether additional plates are advisable or not in the treatment of Rand basket, then the object of this paper will have been realized.

### The Sturtevant Clutch.

The automatic clutch illustrated herewith, while designed primarily for automobiles, will be developed by the manufacturers (the Sturtevant Mill Co., Harrison Square, Boston, Mass.), for other large and small mechanisms.

These clutches allow the prime mover to start without load, and at a predetermined speed the clutches grip and drive other mechanism to which they are connected. They are designed to transmit the largest and also the smallest powers, and by multiplying the number, or size (or both), of the friction discs, they are enabled to hold without slip motors of any class. In some Sturtevant designs the high-speed clutch is held out of engagement whenever the torque or resistance is above a predetermined point. Thus the motor is enabled to run fast on low gears, and develop full motor power on the low-gear train. The friction discs run in oil; and the force used to press them together rarely need exceed fifty pounds to the square inch, which is below common bearing pressures. Some machines carry safely on bearings 600 pounds per square inch. Sturtevant clutches require no adjustments after once setting to engage at the speeds wanted.

These automatic clutches are of advantage to many mechanisms requiring a load to be taken on gradually. Applied to automobiles, centrifugal automatic clutches are placed in the flywheel, and each clutch actuates a set of gears in the gear box. There are three changes of speed. The clutch-enclosing flywheel shell is of common size and the clutches give it necessary weight, therefore add none. The flywheel enclosure forms a bath of lubricating oil.

Each clutch consists of a number of thin cast iron disc plates of large diameter that are forced together to grip by the flywheel-enclosed peripheral weights, which move out by centrifugal force (like the weights of a governor) to press the plates together to cause frictional grip. Each weight is held back by springs, and only when rotations cause centrifugal force to overcome the springs can the weights move out to cause the plates to grip. The plates "let go" as

the clutch weights are forced farther out, and, overcoming the second set of springs, force the second-speed clutch discs to grip, and then the car is driven by the second-speed gear; so, as the flywheel runs faster, the direct driving clutch engages. Silent ratchets permit the lower-speed gears to overrun when the higher speeds are operating, but they then do no work.

The manufacturers say that these clutches are so powerful that they can be depended on for sure grip; that they grip and let go just at the right time; automatically change gears just when road resistance requires it; change gears smoothly, it not being possible in changing to break or damage gear teeth; never permit the motor to be stalled, whatever the difficulties of the road or however carelessly the car is manipulated, for if the motor is slowed from any cause below 300 revolutions, the clutches must let go and the motor runs free and does not race, for it is governed; silently act upon all driving mechanisms, for they engage gradually; give every range of car speed, from the lowest to the highest; the car can be moved as slowly as the hands of a clock by silently moving the foot button to throttle the motor and cause the clutches to slip a little; and that they automatically compel the highest driving efficiency.

The Sturtevant multiple disc clutches are covered by several patents; yet more are applied for.

### Map of the Niwot, Colorado, Quadrangle.

Adjacent to the Boulder quadrangle in Colorado is the Niwot quadrangle, which became interesting to the world when oil began to flow at Boulder. It was accordingly surveyed in 1902 by members of the United States Geological Survey, H. L. Baldwin Jr. and F. Tweedy doing the triangulation and F. Tweedy, P. Chapman and F. McLaughlin the topography. The finished map is now ready for general distribution and may be obtained for 5 cents a copy on application to the director of the United States Geological Survey, Washington, D. C.

Besides the oil wells in the southwestern part of the quadrangle, this area contains extensive coal mines, which are centered near the little town of Erie, in the southeastern part of the quadrangle.

Longmont, the most important town of the quadrangle, is the center of extensive sugar beet and canning industries. The whole quadrangle is covered with fine farms, on which large crops of hay, alfalfa and fruit are raised. The high degree of cultivation seen here is due to an extensive system of irrigation. The water for this purpose is taken from Boulder, Lefthand and St. Vrain creeks.

### Coal in Idaho.

The announcement that coal of a very fair quality has been discovered in Thunder Mountain, says Fuel, serves to revive interest in the development of that newest of Idaho's resources. Discoveries of coal have been reported at various points during the past few years, but those who control the loca-

### Balance Equipment of the Denver, Colo., Mint.

The contract for the balance equipment of the new Denver mint has been awarded to Henry Troemner, 911 Arch street, Philadelphia, Pa., and early shipments will begin next month. This contract calls for twenty balances, ranging in size from the most delicate assay balance to huge bullion and coin scales with 6-foot beams, together with a large number of special scale pans, coin boxes and weights. Many of the balances will be specially designed to meet the requirements of the Denver mint.

One of the latter is a 3-foot aluminum beam balance of 1000 ounces capacity for each pan and a sensibility of .001. It is acid proof. The lighter parts are gold plated, all iron parts enameled with acid proof enamel, the whole enclosed in a mahogany case. This balance is to be used in the acid room of the mint and will cost \$860. The set of weights for it range from 500 ounces down to  $\frac{1}{1000}$  ounce. The entire set is in a mahogany block and costs \$200. Another 3-foot aluminum beam balance, with a capacity of 700 ounces and a sensibility of .001 ounce, entirely encased in mahogany, is to be used by the adjuster for standardizing all scales and weights in the mint.

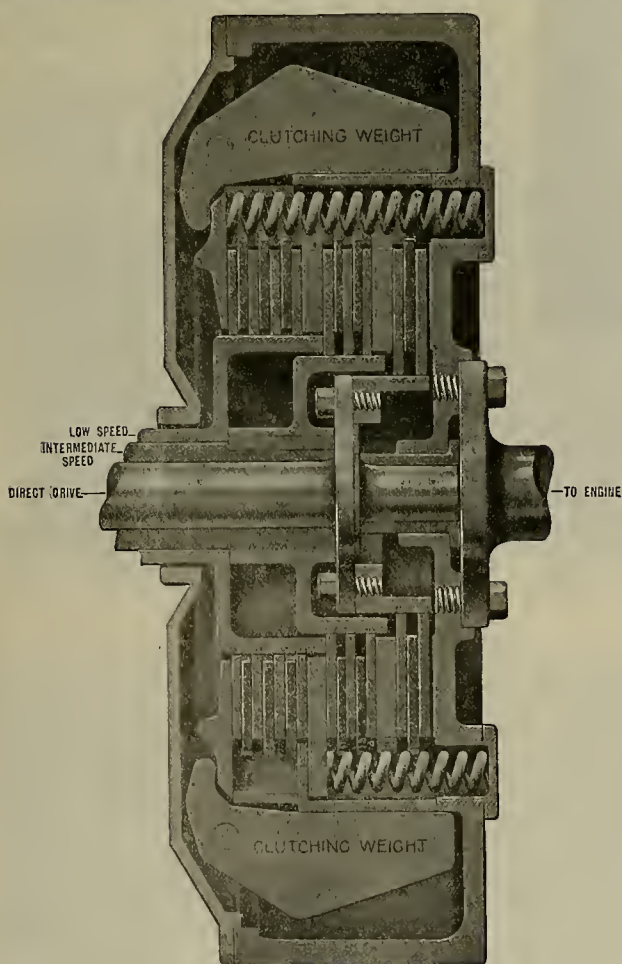
For the assay department there are four of the regular Troemner No. 7 assay balances and one "04" balance, the latter heavily gold plated and of the highest sensibility. In the bullion department will be three 6-foot aluminum beam balances with a capacity of 10,000 ounces in each pan and a sensibility of .01 ounce. Each of the above will be fitted with hard steel hammered pans. Included in the contract are two 5-foot balances with a capacity of 5000 ounces in each pan, two 3-foot with a capacity of 2500 ounces in each pan, and six 3-foot with a capacity of 1000 ounces in each pan. All of the above will be made with aluminum beams, and all will be adjusted to a sensibility of .01 ounce. For laboratory work in the mint two special analytical balances are being constructed, each with a capacity of 100 grams and a sensibility of .05 milligram. These balances will have aluminum beams, agate knives, agate bearings and plate glass sub-bases, and will be acid proof.

To equip the several balances mentioned above, there will be seventy-three solid brass weights of 500 ounces each, and twenty sets in covered mahogany blocks, ranging from 500 ounces to  $\frac{1}{1000}$  ounce in size. For use in weighing coin there are ordered 150 coin boxes of heavy tinned iron,  $6\frac{1}{2} \times 6\frac{1}{2} \times 3$  inches, made in nests of one dozen each. There are also eight large steel pans for weighing bullion, scrap, etc., and six steel strip pans, equipped with suitable handles, for expeditiously handling large quantities of gold or silver coin strips before they go to the stamps.

For use in the deposit weigh room there are thirty-six specially constructed heavy copper boxes with Yale paracentric keys and locks, and two master keys, which will be held respectively by the chief coiner and his assistant.

The entire contract approximates \$25,000, and is believed to be one of the largest orders for balances ever given to one manufacturer.

Director of the Mint Roberts writes that the entire



PATENTED

The Sturtevant Clutch.

soon as revolutions lessen sufficiently to permit the springs to force back the weights and separate the disc faces. In the Sturtevant 1904 car the springs of the low-speed clutch weights are set to permit the low-speed discs to grip and start the car as soon as the motor has reached a speed of 300 revolutions. The low-speed clutch then seizes and drives its gears. When the motor is allowed to reach 500 revolutions,

tions have, as a rule, been unable to develop the properties to a depth sufficient to demonstrate the value of their holdings from a commercial point of view. The coal found in Thunder Mountain is said to have increased in quality and quantity with depth, having been developed about 50 feet. The Pollard mines, in Lemhi county, have been opened up systematically and are yielding large quantities of coal.



A Large Gold Weighing Machine.

equipment will be shipped in time to have it ready July 1st, when the institution will be opened as a coinage mint. It is expected by Director Roberts that legislation will be enacted during this session of Congress authorizing the Secretary of the Treasury to direct coinage of nickels and pennies at San Francisco and Denver mints as well as at Philadelphia, the only place where they are now coined.

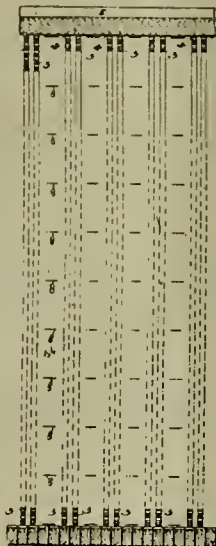


# Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 10, 1905.

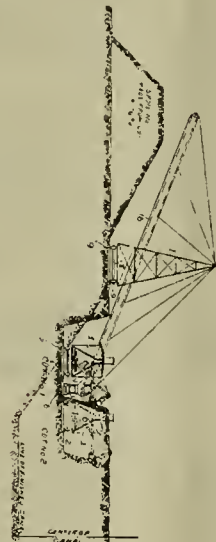
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

METHOD OF RECOVERING TOGETHER THE METAL VALUES CONTAINED IN SLAG AND MINE WATERS.—No. 779,252; R. Baggaley, Pittsburg, Pa.



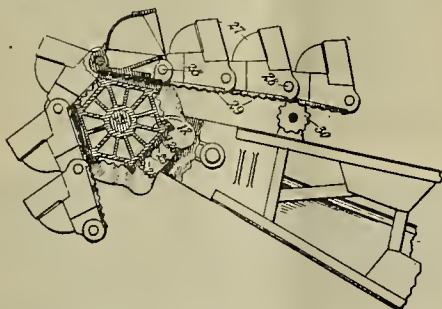
Method of recovering values from water containing copper in solution, which consists in passing such water through successive vessels containing iron and causing it to drop from one vessel to other.

EXCAVATING APPARATUS.—No. 779,043; G. H. Hulett, Cleveland, O.



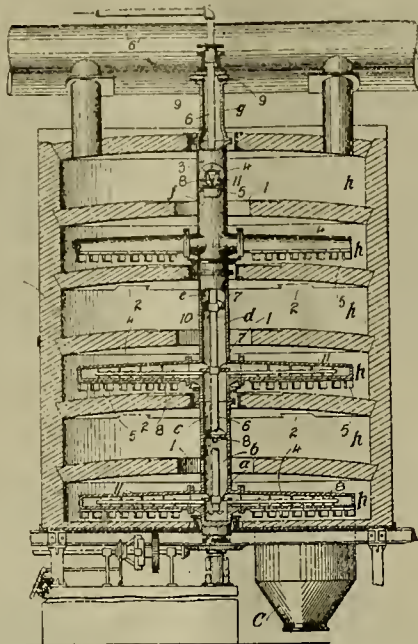
Combination with track laid longitudinally in cut, steam shovel or other excavator thereon, second track parallel with first track, car carrying hopper and conveyer, and feeder located below hopper and adapted to alternately open and close bottom of hopper and force material discharged therefrom into conveyer, of second conveyer for carrying spoil and depositing it to one side of cut.

DREDGER.—No. 779,782; J. Henderson and H. G. Peake, Oroville, Cal.



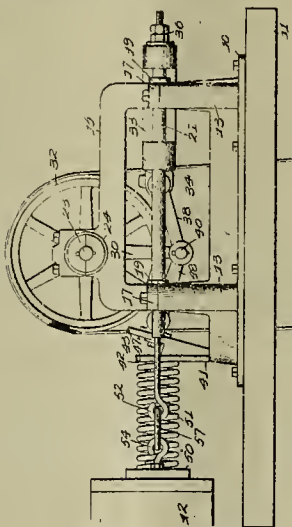
In dredger, combination with upper and lower wheels, of series of buckets movable over wheels and having alternate projections and depressions, and supporting roll situated between wheels and having co-operating projections and depressions.

ROASTING FURNACE.—No. 779,717; F. Klepetko, New York.



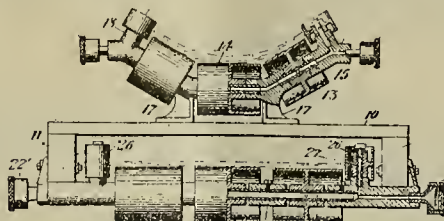
In furnace having plurality of hearths, rotatable hollow shaft passing through hearths, series of hollow arms radiating from shaft and extending into several hearths, series of chambers distributed throughout shaft and communicating with hollow arms, means for permitting circulation therethrough of current of air, and series of deflecting ribs disposed along inner surfaces of hollow arms.

SHAKER FOR CONCENTRATING TABLES.—No. 779,857; J. Klein, Desloge, Mo.



In shaker for concentrating tables, reciprocating rods 21 and 22 slidingly mounted; crank shaft 23 mounted above and transversely of rods; driving rod 30 operated by crank shaft; sliding head 33 rigidly mounted upon reciprocating rods 22 and 23; arm 43 rigidly mounted in inclined position; toggle joint head 46 adjustably mounted upon arm; links connection toggle joint head to sliding head 33 and to driving rod 30; concentrating table; eyes 52 and 53 rigidly secured to forward ends of reciprocating rods 21 and 22; eyes 54 and 55 rigidly secured to concentrating table, links 57 loosely connecting eyes 52 and 54, link 58 loosely connecting eyes 53 and 55; and expansive coil spring between concentrating table and rigid portion of frame.

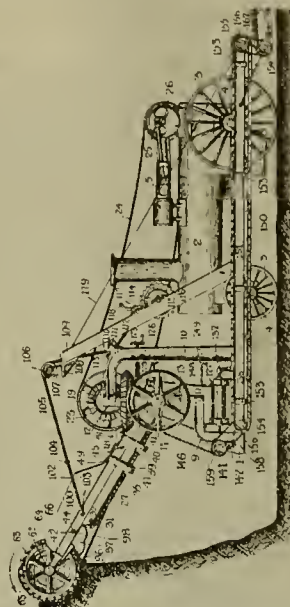
BELT CONVEYOR APPARATUS.—No. 779,666; T. Robbins Jr., New York, N. Y.



In conveyor belt support, combination of set of supporting pulleys and supporting bearings therefor, bearings carrying pulleys in common plane transverse to travel of belt in position to support belt, and pulleys for bearing against edge of belt to lat-

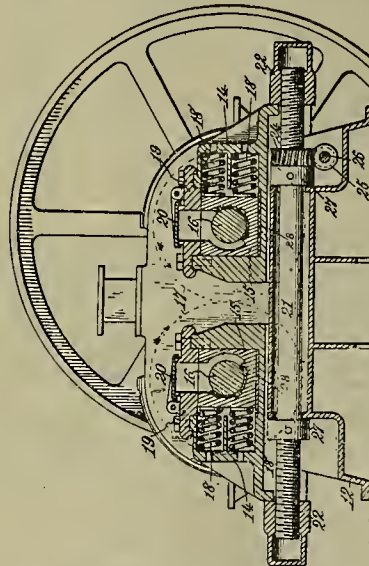
erally guide it, guide pulleys being mounted in same transverse plane with supporting pulleys.

EXCAVATING APPARATUS.—No. 779,442; J. T. Richmond and N. H. Beebe, Anthony, Kans.



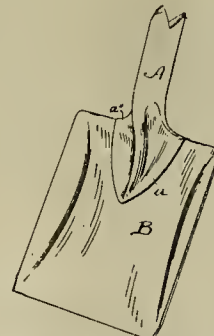
In excavating apparatus, combination with power mechanism and excavator, of carrier mechanism from which excavator is supported, carrier being adjustable vertically, horizontally and longitudinally.

ROLL CRUSHING MILL.—No. 779,566; T. L. Sturtevant, Quincy, and T. J. Sturtevant, Wellesley, Mass.



In roll crushing machine, combination with pair of crushing rolls and shafts by which rolls are carried, of bearing supports or carriers rear portions of which are recessed, bearing boxes movably mounted in supports or carriers, and nests of coil springs housed in rear recessed portions of supports or carriers and yieldingly holding the boxes in working positions, bearing supports or carriers being provided with tie caps hooked over ribbed portions.

SHOVEL.—No. 779,546; W. S. Judd, Cleveland, Ohio.



In shovel, in combination, blade, and tubular socket having on its lower end two integral wings whose upper ends extend laterally on opposite sides of socket piece and are integrally connected together at sides of socket, blade being inserted between wings with upper edge in contact with part which unites them, and being secured to wings.



## Notes on Crushing of Metalliferous Ores in the Stamp Battery in Africa.

NUMBER V.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by  
F. C. ROBERTS.

In an ordinary battery of, say, 200 stamps, the superficial plate area amounts to 2400 square feet. For the purpose of saving time alone it appears to the writer that it would be a great advantage if this or any area was segregated into, say, three lines of copper plate, each having a superficial area of 800 square feet or more, providing, of course, that the effective conditions of amalgamation were observed.

It would be quite simple, when plate scraping or dressing became necessary, to deflect the pulp from any one line of plates to any other line or lines while this operation was being carried out, and it would then be possible to dress more frequently without having to regard the loss of time.

The number of amalgamators per unit might also be with advantage reduced. It might be urged that the effective principles of amalgamation could not be observed with the plates so far removed from the mortar boxes, as would be necessary in the suggested arrangement, but it is contended that any conditions may be obtained by a simple modification of the plate arrangement. In case of a classification of the product a more elaborate arrangement of plates would become necessary, as the grade of plate, the quantity of water and other factors would require to be made to suit the individual products.

The segregated costs of milling 38,054 tons of ore in a typical Rhodesian mine (capacity of plant 3200 tons per month) are as follows:

	Total.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 2,232 14	\$0.060	4.8
White wages.....	4,630 44	0.126	10.3
Native wages.....	1,680 36	0.044	3.5
Native food.....	618 46	0.016	1.3
Stores.....	4,455 28	0.117	9.4
Explosives.....	3 66	0.001	0.0
Fuel.....	5,603 18	0.147	11.8
Maintenance.....	4,141 76	0.108	8.7
Workshops.....	866 72	0.008	0.7
Mill engine and boilers.....	8,553 38	0.224	18.2
Pumping station.....	2,157 40	0.056	4.5
Electric lighting.....	520 02	0.013	1.1
Transport.....	28 40	0.000	0.0
Native hospital.....	54 22	0.001	0.1
Native labor supply.....	30 80	0.000	0.0
Pumping (from mine).....	1,658 46	0.043	3.5
Compound.....	827 48	0.014	1.1
Sorting and crushing.....	8,793 44	0.230	18.8
Assaying.....	1,236 58	0.037	2.2
Totals.....	\$47,552 08	\$1.245	

It will be observed that the account, "sorting and crushing," has been charged to milling in the above statement, whereas if this account be excluded the total milling charge amounts to \$38,769.14, or \$1.015 per ton milled. This account was included as being relevant in this case and it is sometimes the custom to charge it direct to milling, although the writer prefers to treat "sorting and crushing" as a separate account.

In Rhodesian practice the cost of stores in a mill shows some little fluctuation, according to the distance to be covered by wagon transport. A very fair idea, however, may be obtained from the following figures which have been compiled from the average cost per unit of the several articles at four different milling properties, taken over extended periods.

The tabulation below refers to 28,751 tons crushed:

	Total.	Cost Per Ton.
Mercury.....	\$ 46 02	\$0.0016
Waste.....	28 64	0.0010
Oils and lubricants.....	463 76	0.0161
Shoes.....	1,585 50	0.0554
Dies.....	776 34	0.0270
Cam shafts.....	91 26	0.0031
Stems.....	51 60	0.0017
Cams.....	30 44	0.0010
Screening.....	154 00	0.0050
Candles.....	5 40	0.0001
Spikes, etc.....	3 80	0.0001
Nuts and bolts.....	5 80	0.0002
Pipes and fittings.....	44 74	0.0010
Deals.....	3 26	0.0001
Sundries.....	101 12	0.0030
Totals.....	\$3,403 88	0.1164

The following is a schedule of the stamp mills and their capacities erected and under construction in Southern Rhodesia:

Name of Company.	No of Stamps.	Remarks.
*Anterior.....	10	Cyanide plant.
*Alice.....	5	
*Alice Proprietary.....	10	
*Ayshire.....	60	Cyanide plant.
*Bonsor.....	50	Cyanide plant.
*Beatrice.....	10	Cyanide plant.
*Cotopaxi.....	10	
*Camperdown.....	10	
*Deven, Grant.....	5	
*Dobie.....	5	
*Dunraven.....	20	
*Dumblaton.....	5	
*Eagle & Vulture.....	15	
*Geelong.....	40	Cyanide plant.
*Globe & Phoenix.....	40	Cyanide plant.
*Gulnia Fowl.....	6	
*Gwelo.....	5	
*Imani.....	10	
*Inez.....	10	
*Killarney.....	20	
*Lone Star.....	5	Huntington, equivalent 5 stamps.
*Meyin.....	10	
*North Albion.....	10	
*Penhalongra.....	10	
*Red & White Rose.....	40	Cyanide plant.
*Rezenda.....	20	Cyanide plant.
*Sabiwa.....	40	Cyanide plant.
*Matahele Sheha.....	10	

Selukwe.....	40	Cyanide plant.
*Surprise.....	20	
*Standard.....	10	
*Theta.....	5	
*Victoria.....	10	
*Wanderer.....	60	Cyanide plant, dry.
*West Nicholson.....	60	Cyanide plant.
Total.....	706	

\*Mill closed down.  
†Mill under construction.

The monthly output of gold in (bullion) ounces from Southern Rhodesia varies from 18,000 to 24,000 ounces (the value of the ounce ranging between \$12.40 to \$18.60), according to the fineness. The large fluctuation in the output is due to periodic stoppages, which become necessary in order to allow the development work to be extended.

CORRECTION.—In the issue of January 14, on page 21, third column, line 14 from the top, the statement that 21 pounds of lime per ton of ore was used to neutralize acidity should have read 2 pounds.

## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The fluctuations of the production of precious metals in Alaska during the last five years are noted in a recent bulletin of the U. S. G. S. From 1898 to 1900 there was an increase in value of over \$5,500,000, followed by a falling off in the succeeding year of nearly \$1,500,000, which was more than regained in 1902. The output of 1903 shows an increase of \$300,000. The production of quartz mines during this period has not varied from year to year over 20%, and the value of their silver output is so small that it can be disregarded. The fluctuation of the total production is a reflection of the status of the placer mining industry. Moreover, as nearly five-sixths of the gold derived from placers comes from the Seward Peninsula, it is patent that the production of this district is the governing factor in the entire output. The rapid exploitation of the rich placers at Nome, in 1899 and 1900, especially the easily mined auriferous beach gravels, brought up the total values with a bound, but this was followed by a reaction; for two favorable seasons sufficed to almost exhaust the beach placers, and to make serious inroads on some of the bonanzas of the shallower creek deposits. This fact, combined with a rich harvest of legal complications which had arisen at Nome, together with a very short and unfavorable season, led to a discouraging falling off of the placers in 1901. Meanwhile, however, the more enterprising operators had recognized the necessity of improving the mining methods, and consequently the building of ditches and the introduction of hydraulic methods had by 1902 gone far enough to bring the production up over the \$8,000,000 mark again. The same general conditions existed through 1903. Though many extensive plants are being installed and 100 miles or more of ditches are being constructed in the peninsula, but few of these are in operation. The development of the bedrock mines is relatively slow, and much the larger part of the lode gold comes from the famous Treadwell group. In the Juneau district much activity was displayed in lode mining during 1903, and some large properties changed hands. A few small gold mines were in operation in the Ketchikan district and other properties were prospected, but it was on the copper deposits of this region, rather than on the auriferous veins, that the attention of the mining public was centered. Gold-bearing quartz veins have been found in other parts of Alaska, but few of these have been developed so far as to reach a productive stage. Perhaps the most significant feature of lode mining in 1903 was the establishment as a commercial success of the Big Hurrah quartz mine on the Seward Peninsula. This little property, with its ten stamps, represents the only effort at quartz mining in northern Alaska. The production of the Seward Peninsula placers is estimated to be about \$5,000,000, of which probably three-fifths are taken from the Nome district and one-fifth from Ophir creek. The Yukon region, including Forty Mile, Birch Creek, Rampart, Koyukuk, and the Fairbanks district, had an output for its placers of probably \$1,000,000. Most of the camps of this region are so isolated as to make the cost of mining a very large percentage of the production. In only a few instances have extensive mining plants been installed in this field, and most of the gold is taken out in small quantities by more or less primitive methods. The Fairbanks district comprises a dozen creeks tributary to the Lower Tanana, from which they are only 15 to 20 miles distant. The auriferous gravels appear to occur in considerable thickness, and the values though not high are fairly uniformly distributed.

### ARIZONA.

#### Mohave County.

At the San Francisco mine of the Yucca Cyanide M. & Co. at Cedar the shaft will be sunk to the 800 level under charge of C. D. Pickering.—The property of the New Comstock M. Co. has been sold to W. C. Howard and others of San Francisco, Cal., who will equip it with machinery and sink the shaft to a depth of 300 feet.

#### Yavapai County.

The Supreme Court of the United States has decided the case of the United States vs. the United Verde M. Co. of Arizona, which was a proceeding to recover \$38,000 on account of timber cut from the public lands and used in roasting ore, in favor of the United Verde Co. The regulation of the Interior Department directed that timber should not be used for smelting purposes,

whereas the law authorized miners to cut public timber for "domestic purposes." The opinion was by Justice McKenna, who held that the words "domestic purposes" included the roasting of ore, and a mining company was entitled to cut timber on public land for that purpose. He also held that the Secretary had no authority to promulgate a regulation extending the scope of the law, as will be the effect in this case if ore roasting is to be construed as ore smelting. The opinion affirmed the decision of the Arizona Supreme Court. Justices Harlan, Brown and Peckham united in a dissenting opinion, based on the theory that ore roasting is not a "domestic process."

### CALIFORNIA.

#### Amador County.

The Treadwell mine, near Volcano, will be started by S. Drake of Seattle, Washington, under superintendence of B. K. Worley.

#### Calaveras County.

At the Reed mine a hoist and mill are being put up. The mine work is under Foreman George Glover.—J. S. White of Oakland has begun operations on his gravel property at the Joses place on the Calaveritas road. M. H. Sunderland of San Andreas has charge.—The Johnson property, on the San Andreas channel, is being worked by D. Fricot, under charge of J. B. Luddy.—Ore has been found at the Blue Jay mine, on the Calaveras river, near Mokelumne Hill, the tunnel having been run 1084 feet, at the end of which a 30-foot crosscut was run. C. H. Blake is superintendent. W. H. Clary, superintendent of the Clary G. M. Co., near Murphys, will build a stamp mill.

#### El Dorado County.

S. Collins and W. Bacchi will develop their quartz mine, near the Esperanza mine, near Garden Valley.—W. Russell and J. Wakefield are preparing to hydraulic their mine in Happy flat, near Garden Valley.

#### Kern County.

The Corona M. Co. of Randsburg will put in new mining machinery.

#### Mariposa County.

(Special Correspondence).—It is stated on good authority that the Green Mountain copper mines at Lewis, 10 miles northwest of Raymond, are to be developed. Several men are cleaning out one of the old shafts, preparatory to further development, and materials are being hauled to the mine, including lumber, powder and general supplies. This is one of the most promising properties on the copper belt in this county and much is expected of it. The copper occurs in a large zone in mica schists, being chiefly in a state of semi-oxidation. The ore in the mines on this belt from Daulton to White Rock are oxidizing so rapidly that they frequently take fire, not only in the cars, but also in the ore bodies. O. R. Sydney has been owner and manager. Raymond, Jan. 18.

#### Nevada County.

The Buckeye M. Co., T. B. Gray of Nevada City superintendent, will build a 10-stamp mill on its property in Willow valley. The tunnel will be driven until it intersects the shaft, which is to be sunk deeper.

Superintendent F. Zeilert will add ten stamps to the 10-stamp mill of the Zeilert mine in Bear valley; sixteen men are at work.

C. A. Brockington, superintendent of the Orleans mine at Nevada City, will put in an air compressor.

#### San Diego County.

S. L. Ward and L. E. Cooley of Imperial and W. Allen have discovered and located twenty-five claims on an onyx deposit 40 miles west of Mammoth Tank, near San Felipe creek, 15 miles southeast of Borega Springs.

#### Shasta County.

The Southern Pacific spur track from Kennett to the smelter site of the Mammoth C. M. Co. will be 2400 feet long, with 1400 feet of siding at the smelter terminus. It will take two months to build it, as a high trestle, a 40-foot fill and a 25-foot cut are called for. The spur will connect with the main line at the mouth of Backbone creek, on the lower edge of the Kennett townsite. It is to be of standard gauge. Teams and men are at work grading for the smelter and laying foundations for the machinery. Office buildings, bunk houses, stables and a boarding house have been put up.

The Mountain C. Co. has transferred forty men from its smelter at Keswick to the refinery and reduction works at Bull's Head point in Contra Costa and to its acid works at Fleming's point in Alameda county. Six McDougal roasting furnaces have also been shipped and the boarding house at Keswick closed.

#### Siskiyou County.

The Medina G. M. Co., operating the Johnson mine at Oro Fino, are putting in an air compressor and drills, to be operated by water power from the Johnson ditch, and will run a 1500-foot tunnel to tap the Johnson ledge.—J. M. Morrison, superintendent of the Morrison-Carlock M. Co. of Quartz valley, will buy machinery to sink 300 feet from their lower level.

#### Tulare County.

At Whiteriver the Bright Star mine will put in a new mill.

### COLORADO.

(Special Correspondence).—From now until spring a number of fatalities may be looked for, on account of snowslides in certain sections of the State. Already a number of deaths have been reported on this account. The recent heavy snows in the mountains have made it exceedingly dangerous to travel, and especially in the San Juan country, where most of the damage is done by the slides. In most cases, slides are known to come down every winter and the people, traveling through those districts, are always in more or less danger of being caught in them. At times the destruction of property is large. Near Telluride, Silverton and Ouray they have been known to do a great deal of damage to mine and mill buildings which are erected too close to their



path.—At least three bills have been introduced into the State Legislature, now in session, making eight hours a day's work. It is understood that the Western Federation of Miners, who called the strike in the Telluride and Cripple Creek districts some eighteen months ago, on account of there being no eight-hour law passed at the last meeting of the Legislature, are now opposing the measures introduced in the general assembly. It is hoped something may be done at this meeting of the Legislature to prevent such conflicts between capital and labor that the State has been compelled to undergo the past two years.—Reports have been circulated that Wall Street speculators will not permit the Moffat railroad to be completed, and that it is about to be taken over by one of the larger roads entering the State. Mr. Moffat, who is at the head of the road, has said that the road will be completed and that he has the money to carry through the enterprise without the aid of outside capitalists. The road is completed to the top of the range. The completion of this road means much to the northern part of the State, as it will open up a vast area of valuable mineral land now undeveloped and, in the main, unexplored. The past year prospectors have been at work in the territory through which this road is supposed to pass and it is understood have been rather successful, having obtained good assays from mineral which they have discovered.

Donner, Jan. 16.

#### Boulder County.

(Special Correspondence).—The Isabel has opened up ore and work will be pushed. The Boulder County mine has put in machinery. The Mt. Vernon will start up February 1st. This property has been closed down since January 1st on account of the cold weather. The railroad now is within 1½ miles of the camp.

Caribou, Jan. 14.

The Cash mine at Gold Hill is being worked by the American Queen G. M. Co., L. R. Johnson, manager.

#### Clear Creek County.

The Pittsburg Con. M., M. & T. Co. is grading for a mill at the mouth of Fall river for the Dover mine. At Freeland the Brighton shaft has been sunk 500 feet. Manager Ellis is extending the fourth level east to connect with the Freeland extension workings to give an outlet for the surface water through the Freeland extension and Freeland tunnels.

#### Custer County.

J. W. Northrop of Chicago has bought 900 acres at Silver Cliff, including the Geyser, Silver Bar and Diamond mines, and is building an 80-ton mill to test reduction of the different ores preparatory to putting up a 300-ton mill at the Silver Bar mine.

#### Gilpin County.

R. Hastie, Jr., manager of the Otto Schatz M., L. & D. Co., operating the Caledonia property in Lake gulch, is shipping ore to the Golden smelter, through the sampler at Black Hawk.—The Old Town M. Co. of Russell Gulch is putting in a new electric pump with five plungers.—A. Williams of Perigo, foreman of the Gold Dirt mine, says the company intends to build a mill to treat the ores from the Gold Dirt. Three 100 H. P. boilers will be put in.—The Imperial G. M. & M. Co., operating the Mackey and Sarah Jane groups in the Pine district and owning the Mountz & Palmer mill at the mouth of Elk and Pine creeks, is employing twenty men under the management of L. J. Mountz. The milling ores are being saved for treatment at their own mill.—The Golden Sun M. & M. Co., operating between Rollinsville and Boulder Park, is driving its main tunnel from the south side of South Boulder creek into the mountain, under charge of L. A. Shearer.—The Sunset G. M. & M. Co. are sinking to the 825-foot level of the Justice, near Russell Gulch, and are drifting on the 220, 420 and 570-foot levels. J. F. Stanish is superintendent.

#### San Juan County.

Work has commenced on the Hercules Con. mines on Sultan mountain, and T. Kane of Silverton, the manager, states that forty men will be put on the property to continue the Empire tunnel 1000 feet beyond its present point of 2545 feet.—A survey has been made for a tram line from the Mogul mine 1½ mile to the mouth of Dry gulch, below Gladstone.—The Old Hundred tram line is being pushed and will be completed by Feb. 1.

J. C. O'Neill has from the Malchus Bros. of Silverton an option on the Mayflower group on Round and King Solomon mountains, and will continue the Arastra gulch tunnel, now in 300 feet, to cut the Mayflower vein.

W. Fiegel of Silverton is building a Bleichert tramway from the upper workings of the Barstow mine on Red mountain to the mill.

#### Summit County.

The Michigan mine at Kokomo, under charge of G. I. McDonald, is shipping fifty tons of pyritic ore daily.—The Willey mill at Kokomo has been remodeled and new stamps and machinery put in place.—The Union Con. group at Gold Hill is being developed under the management of M. Gagan.

#### Teller County.

(Special Correspondence).—H. D. Williams of Denver has a bond and lease on the Lawrence Gold Dollar, adjoining the Strattons Independence. The shaft is down 180 feet and tunnel 190 feet in length. An electric plant will be installed to drive the tunnel.

Victor, Jan. 14.

(Special Correspondence).—The District Gold Extraction Co., F. J. Buck, manager, is handling fifty tons of ore through their cyanide plant and claim to be making 87% extraction. They are using zinc powder instead of zinc shavings. The ore is taken from a dyke about 20 feet wide and from the surface by a plow and scraper.—The Cripple Creek Homestead Co., on Ironclad Hill, expect to have their new mill in operation about March 1st. The machinery has been shipped. The old mill of the company is kept busy. The new mill will have a capacity of 750 tons per day.

Cripple Creek, Jan. 17.

(Special Correspondence).—Much work is being done on the fifth, eighth, ninth and tenth levels in the Vin-

dicatur mine on Bull Hill. They will start a winze from the 500-foot to the 800-foot levels. The main shaft is down 1200 feet, but no work is being done below the tenth level on account of water. Work will probably not be resumed below the tenth level until pumping arrangements can be made with some of the adjoining mines, especially the Golden Cycle, with which they are in litigation over the pumping proposition. It is claimed that the deep drainage tunnel will not benefit this portion of Bull Hill in the least. Water is being pumped from the tenth to the eighth levels and from there to the surface. E. J. Trevorron is superintendent, and F. J. Campbell of Denver, general manager.

Independence, Jan. 14.

At the Rubie, belonging to the Merger G. M. Co. on Bull hill, ore has been found at 1300 feet by Manager W. J. Storke. Being found at such a great depth, the find disproves the statement of the governmental experts, who are inclined to believe that the ore zone below the 1000-foot point will not result in much good. Operations have been resumed on block 11 of the Work Co.'s property after a temporary close down, during which a new plant of machinery, including an air compressor, was put in. The main shaft of the Moon-Anchor, on Gold hill, is to be deepened. The water level has receded sufficiently to permit of sinking without pumping.

### IDAHO.

Advance sheets of the annual report of State Mine Inspector R. N. Bell show the value of Idaho metal production by counties during 1904: Ada—Gold, \$995,677; silver, \$22,400; total, \$1,019,077. Bannock—Gold, \$2810; silver, \$1110.20; copper, \$2600; total, \$6520.20. Bingham—Gold, \$4360; silver, \$7,040; total, \$4367.04. Blaine—Gold, \$10,424.08; silver, \$527.73; lead, \$354,885.89; total, \$792,590.70. Boise—Gold, \$326,733.99; silver, \$7317.40; total, \$334,050.39. Canyon—Gold, \$8487.51; silver, \$76.35; total, \$8563.86. Cassia—Gold, \$5585.65; silver, \$34.85; total, \$5620.50. Custer—Gold, \$85,452.07; silver, \$284,021.45; copper, \$313,239.29; lead, \$16,881.97; total, \$699,595.38. Elmore—Gold, \$561.60; silver, \$2239.73; total, \$84,934.61. Fremont—Gold, \$561.60; silver, \$3.61; total, \$565.21. Idaho—Gold, \$253,837.10; silver, \$2843.55; total, \$256,680.65. Kootenai—Gold, \$8268.41; silver, \$91,644.18; lead, \$62,092; total, \$162,004.59. Latah—Gold, \$253,960.09; silver, \$1915; total, \$255,875.09. Lemhi—Gold, \$253,960.09; silver, \$59,005.89; lead, \$84,366; total, \$397,331.88. Lincoln—Gold, \$1558.87; silver, \$17.16; total, \$1575.67. Oneida—Gold, \$5394.87; silver, \$16.77; total, \$5411.64. Owyhee—Gold, \$512,512.65; silver, \$1,077,262.23; total, \$1,589,774.88. Shoshone—Gold, \$147,092.94; silver, \$8,380,982.94; lead, \$9,311,200.43; copper, \$364,000; total, \$18,203,275.63. Washington—Gold, \$28,799.30; silver, \$124,288.57; copper, \$25,021.62; total, \$178,109.49. Grand total, \$22,838,299.35.

#### Blaine County.

The Wood River Zinc Co., of Portland, Oregon, will build a 200-ton mill to treat the zinc ores near Hailey. W. E. Prudhomme is president, J. J. Chambréau is secretary and auditor. W. E. Sullivan of Hailey is resident agent in Idaho. J. Williams is general manager. The offices are at 250 Alder street, Portland, and Hailey, Idaho.

#### Boise County.

D. Kennedy of the Lincoln mine at Pearl will put in a 150-ton cyanide plant. A 10-ton plant was built at the mine to test the process and showed a saving of 92%. The new shaft is 85 feet deep.—It is reported that Manager Combs of the Osborne mine at Pearl will build a mill.

#### Idaho County.

At the Lily May, on Red river, 5 miles south of Elk City, owned by the Elk City G. M. & M. Co., J. A. Coverly, superintendent, the tunnel is in 210 feet.

#### Shoshone County.

(Special Correspondence).—The Highland Chief mine, on Pine creek, west of Wardner, has shipped a car of ore averaging 44% lead and 35 ounces silver to the ton.—The Black Horse group, east of the Bear Top mine, near Murray, struck 12 inches of carbonate ore 70 feet from the surface.—The Knickerbocker, in Rosebud gulch, Evolution mining district, below Osborn, has been bonded to T. N. Barnard and E. J. Hunter of Wallace for \$15,000. Work will begin at once.

Wallace, Jan. 16.

M. Glendenning of Wallace reports the Cœur d'Alene output for 1904 as follows:

	Lead.	Silver.	Total
Pounds.	Ounces.	Value.	
Federal.....	94,300,000	3,032,000	\$ 5,366,370 00
Bunker Hill & Sullivan.....	61,438,098	1,094,100	2,991,661 83
Morning.....	29,884,076	507,853	1,441,282 76
Hercules.....	14,000,000	900,000	1,054,250 00
Hecia.....	15,000,876	448,589	836,328 79
Frisco.....	1,400,483	48,845	84,249 60
California.....	977,880	21,918	10,196 43
Silver King.....	230,960	9,520	14,665 58
Stewart.....	195,000	5,250	10,518 12
Gold Hunter.....	184,400	7,200	9,286 40
Monarch.....	118,400	1,120	5,199 60
Terrible Edith.....	87,000	375	1,639 18
Bear Top.....	37,000	375	1,639 18
Blake Bros.....	20,000	800	1,228 00
Safford Bros.....	30,000	750	1,584 37
Snowstorm.....	.....	168,000	96,280 00
Totals.....	217,909,071	6,247,795	\$11,966,374 83

Copper production, \$300,000; gold, \$109,400; grand total, \$12,365,374 82.

These figures differ somewhat from R. N. Bell's estimate.

### MISSOURI.

#### Jasper County.

The Underwriters' Land Co. is putting up an 800-ton plant for concentrating lead and zinc ores from the two incline shafts being sunk at the Yellow Dog, in the Joplin district. It is to be operated by electricity furnished by the Spring River Power Co. There will be three Ingersoll-Sergeant air compressors, each driven by a 20 H. P. Westinghouse induction motor. The mill is to be built in two sections.

### MONTANA.

#### Beaverhead County.

The Polaris mine at Polaris has changed hands and is

to be worked by the first of March. The company is going to put in a smelter. M. Hays has charge.—At Farlin, the Amalgamated Copper Co. is putting in new machinery preparatory to starting operations in the Indian Queen mine, including a 60 H. P. engine, a boiler and an air compressor.

#### Jefferson County.

J. C. Cory of Helena is working the Minah mine, near Wickes.

### NEVADA.

#### Esmeralda County.

R. G. Butler of Las Vegas, Nev., is considering building a road for a freighters' line from Las Vegas to Ash Meadows, 77 miles, with four watering places; Ash Meadows to Gold Center, 85 miles, with one watering place; Gold Center to Breyfogle mines, 9 miles; Gold Center to Goldfields, 70 miles, with four watering places; Las Vegas to Bullfrog, 124 miles; Las Vegas to Goldfields, 193 miles.

J. H. Spiking is building a stamp mill at Goldfield and has ordered a cyanide plant. Water for milling purposes has been developed by wells near the mill.—The Goldfield-Sierra M. Co. has commenced a shaft on the Ajax vein at Goldfield. W. W. Kirby is in charge.—The Goldfield-Sovereign M. Co., in which W. M. Downing of Denver, Colo., is interested, has purchased the Johnson No. 1 and Johnson No. 2 on Banner mountain, the Now York Nos. 1 and 2, 1 mile east of the Johnsons; the Tom Henry, ending the Great Bend on the west, and the Snowflake, ½ of a mile north of Kendall, for \$27,000. F. E. Horton is resident manager. Work has been commenced on Johnson No. 2.—On the Montana-Bullfrog at Bullfrog, M. Walsh has been appointed superintendent. A tunnel will be started to tap the ledge at a depth of 150 feet. The telephone line which H. H. Clark is building is completed to Thorp's mill and will probably be finished to Amargosa by February 15. The new wagon road is practically completed to Amargosa and the distance is shortened to 55 miles.

The Joshua Man G. M. Co. is developing a shaft on the Overlook claim, now 45 feet deep, and a tunnel on the Joshua Man, in 210 feet. F. J. Campbell of Denver, Colo., is general manager and F. E. Brown has charge at Goldfield.—J. McKane has bought the Davenport group, 5 miles east of Goldfield, and will put in a hoist and sink to a depth of 500 feet before cross-cutting.

#### Humboldt County.

The 40-ton cyaniding and concentrating mill at the Golden Eagle mine, near Golconda, owned by the Glasgow & Western Exploration Co., has been started.

#### Lincoln County.

It is reported that C. O. Whiteman of Salt Lake City, Utah, will equip the Panaca mine with machinery.

Superintendent F. J. Harrington is putting in a 60 H. P. hoist for the Quartette mine, near Searchlight, and a 64 H. P. engine for the mill. Settling tanks have been ordered for the mill. The shaft is within 60 feet of the 800-foot level.

#### Nye County.

The Tononah Railroad is widening its tracks that it may be ready to bring broad gauge cars to Tonopah as soon as the Carson & Colorado line is standardized as far as Sodaville. Manager Tripp says this line will be ready to accommodate broad gauge cars before the Southern Pacific. Upon completion of the work the time between Tonopah and Reno will be reduced to eight hours.—J. McKane has leased half of the Quartzite fraction at Diamondfield, and is removing machinery from the Jumbo to the lease.

The Tonopah M. Co., F. A. Keith of Tonopah, general manager, will build a mill to treat ore from their own and surrounding mines.

### OREGON.

#### Baker County.

(Special Correspondence).—The Queen of the West mines have been examined by C. W. Raymond of San Francisco for Minneapolis interests, and it is probable that operations will be increased during the spring. A mill, concentrating plant, aerial tramway and compressor plant, operated by water power, are being considered and development work will be pushed. Eight men are employed in running the lower crosscut tunnel to cut the Queen of the West ledge, giving 400 feet backs. This ledge is parallel to the general system of ledges on the east slope of Cornucopia mountain at Bonanza basin and lies 2000 feet above the Union-Companion and Red Jacket ledge, owned by the Union-Cornucopia M. Co., and has been bought in by the creditors, there being a probability of its being reopened in the spring. This property is equipped with a 20-stamp mill, concentrators and slime tables. The mine, as is the case with all the mines in the district, is operated through tunnels. E. B. Seales of New York was interested. The Cornucopia district abounds in well-defined ledges of high-grade ore, carrying gold, silver and tellurium. The ores plate about 20% and the concentrates average 6%, containing \$200 to \$400 per ton gold. The extraction is a concentrating proposition; the concentrates are at present shipped to the Sumpter smelter. The district is well provided with timber and water; the altitude of the town of Cornucopia is 4700 feet and at the mines 7000 to 8000 feet; distance from Baker City by stage, 63 miles; if the proposed railroad from Baker City to Pine Valley and Homestead is constructed, the district will be of easy access and much active work will be undertaken.

Baker City, Jan. 17.

At the Snow Creek mine, near Tipton, the mill batteries have been realigned and the mortar blocks reset and the 10-stamp mill is running under charge of C. F. Raht of Sumpter. When the station is cut at the 225-foot level, the shaft will be sunk 100 feet.—Manager Field reports that the electric equipment of the Baisley mine and mill, near Baker City, has been completed. A sinking pump will be put in at level No. 3, to allow further sinking. Electricity is used for lighting the camp and underground workings and for running the hoists. Forty men are at work in mine and mill.



Shipping ore has been struck in the west drifts of the 150-foot level of the Mountain View mine at Bourne and is being sent to the Sumpter smelter, of which C. Kirchen is superintendent.

It is reported that the Sagamore mine, 14 miles west of Cornucopia, has been sold to Eastern men.—The boring for water for milling purposes at the Emma mine in the Virtue district, near Baker City, is down nearly 300 feet, without striking water. Pending water supply, the bins at mill and dump are being filled with high-grade ore.

#### Josephine County.

The Greenback Gold M. Co. and the Martha Gold M. Co., operated under one management, have added to the Greenback claims the Scenic, Vulcan, Scorpion, Yellow Dog and St. Peters, and will develop them under the superintendence of R. N. Bishop at Greenback and W. Brevoort. The Vulcan has a 5-stamp mill, and the Yellow Dog a 3-stamp. A 10-stamp mill will be put on the Scenic. Ore from the St. Peters will be brought by gravity tram to the 40-stamp Greenback mill.

#### Lane County.

A 2-stamp battery has been added to the Great Northern milling plant, Blue River district. H. C. Mabon, manager of the Great Northern Development Co., which owns the property, states that the two batteries have crushed eight to ten tons a stamp with friable ore. A Huntington mill will be used for the softer ore. Another concentrating table was put in with the last battery of stamps and another will go in with the Huntington. The main drift is in 625 feet. The lower tunnel is being driven 200 feet below the main shaft and is in 200 feet. The 1200-foot aerial tram contemplated by the management is to be connected with this tunnel.

### SOUTH DAKOTA.

The Mining Review reports that during 1904 the following mills were put in commission:

Name of Company.	Tons—	Daily Capacity.
Black Eagle.....	60	Rockford.
Gilt Edge Maid.....	150	G. A. Duncan, Galena.
Golden Crest.....	50	F. M. Strout, Mill Supt., Galena.
Homestake (increased).....	400	C. W. Merrill, Mill Supt., Lead.
Hidden Fortune.....	120	H. J. Mayham, Sec., Lead.
Horseshoe.....	350	W. L. McLaughlin, Mgr., Hot Springs.
Lundberg, Dorr & Wilson.....	60	At Ferry.
Rossiter.....	100	Bryan Rossiter, Mgr., Deadwood.

Construction was commenced on the following plants:

Name of Company.	Tons—	Daily Capacity.
Branch Mint.....	900	J. C. Hardin, Pres., Galena.
Globe.....	100	F. E. Wade, Lead.
Golden West.....	150	E. J. Kennedy, Sec., Rockford.
Ohio-Deadwood.....	100	I. B. Murphy, Mgr., Hot Springs.
Queen of the Hills.....	100	E. P. Farnham, Sec., Central City.

The following mills are contemplated and construction will be commenced early in the spring:

Name of Company.	Tons—	Daily Capacity.
Bullion.....	200	F. H. Long, 1213 Schiller Bldg., Chicago, Ill.
Columbus.....	1000	M. Thompson, Mgr., Keystone.
Deer Lick.....	150	F. M. Nash, Lead.
Eleventh Hour.....	150	J. Madril, Supt., Spearfish.
Lucky Strike.....	250	C. A. Allen, Mgr., Spearfish.
Reliance.....	300	F. W. Medbury, Deadwood.
Safe Investment.....	250	I. N. Webb, Deadwood.
Saginaw.....	100	L. P. Woodbury, Pres., Chicago, Ill.
Victoria.....	200	G. S. Jackson, Deadwood.

#### Lawrence County.

According to the Black Hills Mining Review, the gold production during 1904 for the Black Hills was:

Name of Company.	Production.
Black Eagle.....	5,500.00
Clinton and Portland.....	3,037.70
Clover Leaf.....	166,200.00
Cochran.....	3,500.00
Columbus Consolidated.....	36,000.00
Dakota.....	90,955.84
Extreme.....	2,500.00
Golden Crest.....	33,815.00
Golden Reward.....	414,190.51
Hidden Fortune.....	136,000.00
Homestake.....	4,950,558.48
Horseshoe.....	412,337.45
Imperial.....	239,800.00
Lundberg, Dorr & Wilson.....	142,000.00
Maitland, A.....	315,078.16
Monarch.....	2,208.54
National Smelter.....	45,056.00
Spearfish.....	236,000.00
Wasp No. 2.....	111,000.00
Placer.....	10,000.00
Total.....	\$7,358,137.78

### UTAH.

#### Juab County

Superintendent J. H. McChrystall of the Godiva mine at Eureka will build a concentrating mill.—The Gemini M. Co. is figuring on putting in two pumps to do away with the hoisting of water. One of the pumps may be put in on the 1000-foot level and another either on the 1600 or 1700-foot levels.—The Eagle & Blue Bell mine at Eureka, J. Creighton, superintendent, will put in a new compressor. The station on the 800-foot level has been completed and a drift will be run 150 feet to tap the main ore body. From the 800-foot level the shaft will be dropped down to the 1000-foot level before another station is cut. The mine is shipping forty tons per day.

#### Salt Lake County.

It is reported that the Boston Con., at Bingham, will put in a milling plant to work its copper-bearing porphyry. It is expected to have a capacity of 500 tons a day and to cost \$100,000. Superintendent S. S. Cates has men developing the porphyry formation.

### WASHINGTON.

#### Ferry County.

(Special Correspondence).—Superintendent W. M. O'Connell of the Ramore mine, at Park City, in the Republic district, says the tunnel in his mine is 800 feet in length and has crossed four good-sized veins, all of which carry fair values in silver-lead, gold and copper.

Republic, Jan. 16.

#### King County.

(Special Correspondence).—A big smelter, to cost \$750,000, is a possibility for Seattle. S. I. Silverman is in communication with the Seattle Chamber of Commerce and promises to erect a 400-ton plant, providing certain concessions are made in regard to a site. The smelter is designed to handle the ores from Alaska's mines.

Seattle, Jan. 16.

#### Snohomish County.

The Rainey mine, near Monte Cristo, is shipping sixty tons of ore a week to the Everett smelter, from the 100 and 200-foot levels.—An electric light plant, with capacity for 150 20-candle power lamps, has been put in at the Golden Chord mine, near Monte Cristo, by J. M. Williams. The dynamo is driven by a 12-inch Pelton wheel at the compressor house.—The Philo mine, near Monte Cristo, is equipped with a 2-hucket tram, 1800 feet long, operated by a gasoline engine, and is connected with the tram of the Pride mine, which has been leased by the Philo company and overhauled and repaired. The company intends installing an air compressor and drills.

#### Spokane County.

D. C. Corbin will build a branch standard gauge railroad from Spokane to the international boundary, where it will connect with a branch to be built to the Canadian Pacific. A 50-year traffic agreement has been made with the Canadian Pacific. The road will be called the Spokane International.

#### Stevens County.

(Special Correspondence).—A third furnace is to be added to the Northport smelter within the next month. The plant is handling 400 tons of ore daily and the additional furnace is to have a capacity of 100 tons. The company has contracted with the Copper King mine, near Chewelah, to handle all the ore it will furnish.

Northport, Jan. 15.

#### Wahkiakum County.

(Special Correspondence).—The Standard Group Marble Co., owning 200 acres of marble land near Rosburg, has opened up a new deposit of variegated marble and has ordered machinery to be installed at the quarries in the spring.

Rosburg, Jan. 16.

## FOREIGN.

### BRITISH COLUMBIA.

According to the B. C. Mining Record, the mineral production of British Columbia during 1904 was as follows:

	Ounces.	
Gold, placer.....	57,050	\$1,141,000
Gold, lode.....	256,135	5,123,000
Total gold.....	313,185	\$6,264,000
Silver.....	3,505,805	1,808,000
Copper.....	36,088,580	4,540,000
Lead.....	37,000,000	1,415,000
Zinc and iron.....		100,000
Total metallic.....		\$14,217,000
Coal.....	1,668,000	504,000
Coke.....	272,400	1,362,000
Building materials.....		550,000
Total.....		\$21,133,000

The production by districts was: Cariboo, \$500,000; Cassiar, \$520,000; East Kootenay, \$4,813,800; West Kootenay, \$6,266,600; Lillooet, \$25,000; Yale, \$4,025,900; Coast (Mainland, Vancouver Island, etc.), \$4,431,700; miscellaneous, \$550,000. Total, \$21,133,000.

#### Boundary District.

Boundary shipments during 1904 were in tons: Granby mines 543,000, Brooklyn-Stemwinder 24,000, Rawhide 2000, Mother Lode 175,800, Sunset 2800, Emma 38,000, Senator 3500, Oro Denoro 15,000, Mountain Rose 1800, Athelstan-Jackpot 4600, High Grade mines 1500, miscellaneous shipments 750; total 812,750.

The British Columbia Copper Co. at Greenwood during 1904 received 211,864 tons of ore, 2489 tons of matte and 1526 tons of blister copper. The total production of metals was: Gold, 35,911 ounces; silver, 116,685 ounces; copper, 5,201,073 pounds.

#### Kootenay District.

(Special Correspondence).—The financial statement of Manager Cronin of the St. Eugene is as follows: Total output, 12,786,860 pounds of concentrates; net value from Trail and Nelson smelters, \$130,053.24; Government bounty on 8,269,537 pounds of lead, \$62,127.94; total net value, \$192,181.18; sold in Europe, 8,692,005 pounds; net value from purchasers, \$127,410.20; Government bounty, \$29,533.20; total net values, \$156,943.91, or about \$3.37 per ton.

Nelson, Jan. 15.

#### Slocan District.

The silver-lead production in tons for 1904 for the Slocan district was: Slocan Star 2808, Ivanhoe 1405, Payne 1130, Reco 1018, Last Chance 388, Ruth 490, Blue Bird 61, Sunset 313, Mountain Con. 210, Sovereign 41, Idaho 980, Ramhler 850, Monitor 20, Cinderella-Medford 175, Red Fox 90, Antoine 60, Majestic 38, Joe Joe 33, Mercury 20, American Boy 42, Lucky Jim 201, Wakefield 420; total 10,973. The production of zinc was in tons: Lucky Jim 3000, Ivanhoe 1073, Payne 974, Idaho 32, Wakefield 160; total 5239.

#### Vancouver Island.

During 1904 the Tyee Copper Co.'s smelter at Ladysmith was in blast 267 days of twenty-four hours each, and smelted 57,450 tons of Tyee ore and 7953 tons of custom ore, 65,403 tons in all. This gives 6025.688 tons of copper matte, containing 5,120,870 pounds of copper, 179,769.19 ounces of silver, 11,088,830 ounces of gold, the total value, less refining charges, being \$831,902.41. A hoisting engine, hoiler and compressor have been put on the "X. L.," belonging to the Tyee Co. property, and a two-compartment shaft has been sunk 150 feet. E. C. Musgrave is superintendent. The main Tyee shaft is down 600 feet and will be continued till 1000 feet deep.—The Vancouver Island M. & D. Co. has put a hoisting engine, hoiler and compressor plant, and sunk a 500-foot two-compartment shaft on the Westholme. At the 300-foot level crosscuts have been driven 860 feet.

## CANADA.

#### Ontario.

The Hamilton Cataract Power, Light & Traction Co have started the two 5000-kilowatt Westinghouse generators in the De Cew falls power station in Ontario. Power is supplied from Welland canal feeders, tapped 14 miles above the power station, and at the station the water has a head of 267 feet. The generators are of the two-bearing type, direct connected to Escher-Wyss water wheels, and run at a speed of 286 revolutions per minute. They generate three-phase current at a frequency of sixty-six cycles, and a pressure of 2400 volts. The power is transmitted to Hamilton, Ontario, where it is used for lighting, street railway and manufacturing purposes. A reserve steam-driven station is at Hamilton, which contains two 1000-kilowatt Westinghouse generators. The entire station and high tension apparatus are of Westinghouse design. The company has two separate three-phase transmission lines to Hamilton, a distance of about 35 miles. The high tension apparatus is designed for a pressure of 40,000 volts, but will be operated for a time at 20,000 volts. W. V. C. Hawkins is general manager of the Hamilton company and engineer in charge.

### MEXICO.

#### Chihuahua.

The shaft on the Capazaya, near Parral, is down 310 feet; crosscutting at the 200-foot level to connect the old and new shafts is being pushed.—The electric hoist has been put in and the power turned on at El Duque shaft of the San Nicolas M. Co.—The Sierra Madre is hoisting and shipping from 300 to 350 tons of ore a week. The pumps have been working continuously since started and the mine is sufficiently unwatered to allow drifting at the 600-foot level, where high-grade ore has been found.—The prospect shaft is down 70 feet on the Salvador property.—The Capazaya, Sierra Madre, Salvador and Almacena properties are under the management of A. M. Davis, with office at No. 1 Casa de Fuentes, Parral.—H. L. Dignowity of San Antonio, G. C. Beckman, manager of the Banco Minero, and G. B. Calnan of Santa Rosalia, will tunnel and sink shafts on forty-five pertenencias in Nalca, 16 miles north of Concho, on the Mexican Central.—C. Rodriguez & Co., owners of the Cigarrera mines, near the center of the Sierra de Almoleya range, 9 miles south of Baca, on the Central Railway, between Jimenez and Parral, has a concession to build a standard-gauge railroad from Baca to its mines, the same to be started inside of six months and at least 10 kilometers built per year. They are putting in an electric plant to run the hoist and drills. The ore carries good values in gold, silver and copper.

At Guadalupe y Calvo it is reported that Superintendent J. A. Peabody will add forty stamps to the mill.

The San Francisco del Oro Mines, Ltd., of 65 London Wall, London, E. C., the Earl of Denbigh, president, and J. E. Hyslop, general manager, are working the San Francisco del Oro, near Santa Barbara, including the Sto. Tomas, Zaynas, Terreros, Las Guijas, La Tuita, La Soledad, San Francisco Nos. 1, 2 and 3, San Jose, La Coheza, La Criada and Nuestra Sonora, all containing 135 pertenencias. The deepest point is 416 feet vertical, or 427 on dip. A new tunnel is being driven, which will come 200 feet below lowest working and will be 2067 feet long. The cable tramway is 2600 meters long and is run by gravity, a small gasoline engine being used as a check. Upon arrival at the terminal of the cable, the ore is passed over grizzlies, separating the fine from the coarse, the latter moving on by gravity to sorting tables, where it is cleaned. In loading, the wagons that transport the ore to the neighboring railroad are stopped under the bridges, to which are attached chutes, the average time of loading being one and one-half tons per minute. At present the wagons go to the Molinos station on the Parral & Durango railroad, and thence to the custom smelters. At this time the mine is shipping from 130 to 150 tons daily. The company will erect a plant for wet concentration, magnetic separation, the slimes and tailings then to be mixed with siliceous ores and treated by lixiviation. A railway is contemplated, which will tap either the Parral & Durango railroad or the Mexican Central railway.

#### Durango.

The Miller-Sibley M. & S. Co. has stopped work in its mines at Topla.—The Amazon G. M. Co. of Chacala is putting in a blast matting furnace with which to handle the copper-lead-hismuth ores. It was found that in the reverberatory furnace, which has been in operation for some time, the oxidation and consequent loss of the himuth was beyond control.

#### Guanajuato.

The Guanajuato R. & M. Co. will build a 160-ton stamp mill at the Cata mine and a 500-ton cyanide mill, near Guanajuato, piping the pulp 1½ mile from mill to cyanide plant. C. L. Kutz is president, H. H. Filley, engineer in charge, and C. W. Van Law, manager.

#### Oaxaca.

L. G. Teruel, president of the Oaxaca & Ejutla Railway, has obtained a concession to put in a metallurgical and smelting establishment in the city of Oaxaca or in Ocatlan or Ejutla, as he may elect. The capacity of the furnace shall not be less than 100 tons daily. The machinery, apparatus, etc., required may be imported free of duty for once only. The construction of the establishment must begin within one year from December 23, 1904, and must be completed within two years of the same date.

Mining machinery is to be purchased for the Baldomera at Ocatlan by C. H. Hamilton.

It is reported that the Predilecta and Tetraxini mines, near Ejutla, will be bought by the El Oro M. Co.

#### Sinaloa.

M. M. Stewart of San Luis Potosi has an eight-year option and lease on the property of H. Amador in Sinaloa, and has ten stamps dropping and three concentrators running; also compressor for drilling and unwatering the mines. All motive power is water.—The Fernando M. Co. of Fernando has completed its 30-stamp mill.—The Toro M. Co. of Canelles has suspended



operations.—It is reported that the San Juan M. & D. Co. will build a 100-ton smelter in Culliacan.

Machinery has been ordered for the San Fernando G. M. Co., near Altata, of which C. W. Pritchett of Denver, Colo., is manager, and plans are being made for a large reduction plant.

The owners of the Alianza and Morelos mines in the Badiraguato district will erect reduction works near the mines. The machinery for the projected plant is now being made in the Sinaloa foundry in Mazatlan. The owners are A. Sanchez, H. E. Gaxiola, C. Vilderrain and E. Vasquez.

#### SONORA.

(Special Correspondence).—The Sonora Bonanza M. Co. at Cananea will sink three shafts on their copper ledge. R. McCune has charge. Brally, Wallace & Dressel report a body of copper and silver ore in the drift on the 100-foot level in their mine near Janoverachi. Cananea, Jan. 14.

A. G. Pace, C. Laux and J. Sattory are prospecting and developing the San Juan and Reina Prieta veins at San Juan Grande, 15 miles from Soyopa, in the Ures district. They are also working placer deposits in the Sibichicori and Rebreo canyons. F. H. Seymour of Torres is interested.

A. W. Morris, superintendent of the Golfo de Oro M. Co. at La Concentraci6n, has ordered a hoisting engine for the new shaft on the Mina de Oro, down 100 feet. The ore is treated in a 10-stamp mill and cyanide plant.

At La Dura a Lidgerwood hoist has been put up by La Dura M. & M. Co. upon the new vertical double-compartment shaft at La Gloria, which is 800 feet deep. It can work to a depth of 1200 feet and has a hoisting capacity of six tons 6 feet per second. D. P. Schabrum is manager. C. W. Phillips of Sonora has taken over the Tres Naciones, Flora and Bellamanda in the Magdalena district, near Brisca, which have been owned by the Canizares Brothers of La Calera. He will build a 10-stamp mill and sink a working shaft on the Tres Naciones.

Richardson Bros. Co. of Los Angeles, Cal., will construct a railway from Guaymas on the Gulf of California to Torin on the Yaqui river, thence up that river to La Dura, across to La Bufa and Trinidad. They own La Bufa mines and a 30-ton custom smelter at La Bufa.

#### NICARAGUA.

The United States Consul reports considerable activity among the mine operators north of Bluefields in the installation of new machinery and the application of modern methods, which promises to increase greatly the output of gold in this region. The Bonanza and Lone Star mines in the Tunkey district are adding cyanide plants for the extraction of gold from tailings. These are expected to be in operation. It is estimated that 50% of the gold is lost in the tailings, and it is believed that this process will save 70% of what has heretofore been thrown away. The Siempre Viva M. Co. is installing an electrical plant, to be run by water power from Piz Piz falls, for the operation of the mill and working of the mines as well as the cyanide process, the total expense being \$100,000. The Constance, near the Siempre Viva mines, is completing a 10-stamp mill, which will shortly be in operation. The La Luz and Los Angeles mines, in the Cuicuina district, are expending \$30,000 in developing their water power and in other improvements. The Topaz M. Co., in the Mico district, above Rama, intends installing cyanide and electrical plants. The placer mines in Cuicuina district are making a good showing, and there is every prospect that by the end of another year the eastern coast of Nicaragua will produce a noteworthy output of gold.

#### PERU.

A. H. Kennedy and G. F. Hutchins of Mexico are constructing the 1000-ton smelter for the Cerro del Pasco mine, being erected under contract with M. P. Connel. The Cerro del Pasco district smelter is east of the Western Cordilleras of the Peruvian Alps, 265 miles from Callao, and is reached over the Peruvian Central and Cerro del Pasco Railroads. The latter was officially received by the Government on July 28, 1904. The road has a mean elevation of 13,000 feet at Cerro del Pasco, reaching 14,200 feet. A branch is being built to the company's coal mines, north of the mine. A. W. McCune is general manager at Lima and Jas. MacFarlane is superintendent of mines at Cerro del Pasco. The mines were worked for silver in 1630. The ores carry gold, silver, copper and cobalt, silver values decreasing and copper increasing with moderate depth.

#### Personal.

C. A. FOHRMAN is superintendent of the Caso Diable G. M. Co. at Bishop, Cal.

W. B. LEWALD is manager of the Ohio-Pennsylvania mines at Argentine, Colo.

L. LINDSAY of Cananea, Mexico, is in Los Angeles, Cal., buying mining machinery.

P. McGERRY, manager of the Comstock group, near Granite, Or., is at Baker City, Or.

D. LANDSBERG has been made foreman of the Treadwell mines, Douglas Island, Alaska.

J. L. SHEPERD of Nogales is manager of the Realito Copper M. Co. at Realito, Sonora, Mex.

G. W. PHILLIPS is manager of the Calera M. Co., 12 miles west of Minaca, Chihuahua, Mexico.

J. W. DIXON of Dunlevy, County Wicklow, Ireland, is examining mines in Tuolumne county, Cal.

F. FAY of Keystone, South Dakota, is in Cananea, Mexico, in employ of the Cananea Con. C. Co.

GEORGE W. MYERS, representing the Chrome Steel Works on the Pacific coast, has gone to southern

California and southwestern Nevada from San Francisco, Cal.

H. C. McFERNY, superintendent of the Eureka Con. at Eureka, Nev., has been visiting San Francisco, Cal.

G. E. ALEXANDER of Marysville, Mo., has accepted the position as metallurgist for the Oro M. Co. at Oro, Ariz.

J. MADILL is superintendent of the Eleventh Hour G. M. Co., at Ragged Top, 8 miles west of Lead City, South Dakota.

A. S. DWIGHT, manager of the Cananea Con. Copper Co., has returned to Cananea, Mexico, from a trip to New York.

H. C. BELLINGER is superintending the reconstruction of the Yampa smelter and United States smelter at Bingham, Utah.

B. F. BOGENREIF of Hinton, Iowa, and P. P. Scott of Romsen, Iowa, have been examining the Vulcan mine at Silver Plume, Colo.

G. ADAMS of Eureka, Utah, is superintending the development of the Surprise group, near Shem, Washington county, Utah.

R. C. COY of Chicago, vice-president of the Libertad M. Co., has been examining the company's mines at Libertad, Sonora, Mex.

H. J. BEEMER of New York, president of the Amalgamated Gold Mines Co. of Quartzsite, Arizona, is superintending work at the mines.

R. HOWARD has succeeded J. R. Sharp as superintendent of the Sunnyside coal mines of the Utah Fuel Co. at Sunnyside, Carbon county, Utah.

F. H. JOHNSON, who has been manager of the mining department of the Fulton Iron Works, San Francisco, Cal., for several years, has resigned owing to ill health, and will sever his connection with the company February 1st. Mr. Johnson expects to spend the next two or three months in the southern part of California and Arizona recuperating.

#### Books Received.

Verily a little knowledge is a dangerous thing, especially if the possessor thereof attempts to impress the unlettered man with the profundity of his studies. In "Secrets of the Rocks" S. M. Frazier gorges us with a non-assimilable mass of undigested facts and theories gleaned mainly from books of the past generation, most of whose propositions have long since been refuted. The expressed object of the book is to give the practical prospector an insight into the wonders of science, combining it with instructions as to intelligent prospecting. Its real effect is to muddle the mind with unproved theories and present a few facts regarding outdoor life that an amateur camper might require. His definitions of scientific terms are loose and indefinite, his compiled facts are illogically and poorly arranged, the treatment is rambling and inconvenient. The book contains little that could not have been written by one who had never seen a rock. Undue prominence is made of the importance of the historical sequence of rock formation as an aid to prospecting. He states that "the primary source of gold is in granite and associate rocks, its presence being due to a coagulation of the small particles in its primary sources. Granite is a close, compact body of fragments of other stony matter." The ponderousness of "science" is lightened by legends and stories of lost mines and wonderfully lucky strikes, a great love for scenery, and accompanying flowery language is displayed. One is especially impressed with the importance of the "trappean" rocks in the "process of world building." If the 432 pages were concentrated to four pages, the prospector might find it interesting for an hour's reading. Its chief recommendation is that it gave some deserving printer a job. It is published by Hall & Williams, 1742 Stout street, Denver, Colo.

"A Treatise on Metamorphism," by C. R. Van Hise, is the latest production of this noted geologist. This monograph, of 1286 pages, will undoubtedly be valuable as a standard reference book for the geologist for many years to come. In following up his object of organizing the examples of metamorphism under the laws of physics and chemistry, the author has written a careful treatise, including descriptions of most of the geological forces active since the formation of the earth. As a text book for students of geology it is good in showing how the present conditions of the earth are the result, not of cataclysms, but of the accumulative effect of chemical energy, gravity, heat, and light, together with gaseous and aqueous solutions and organisms. An application of the latest principles in physical chemistry is lacking and, in view of the rapid strides being made in this science, Prof. Van Hise's assumptions may have to be revised. The chapter on the various changes taking place in the belts of weathering, cementation and anamorphism are valuable in giving reasons for different structures. It is to be regretted that the igneous rocks could not have been discussed, as well as the sedimentary rocks. Much of the discussion on ore deposits has previously appeared elsewhere. On the whole, the book is an excellent compilation. It reorganizes and brings many widely scattered facts and theories into compact form. It is to be regarded as a forerunner in this class of work, leaving much to be done by future geologists, especially in the line of laboratory work in verifying certain hypothetical chemical reactions. To the student of rocks and rock-forming minerals, it apparently does not accomplish what was expected as an aid in rock identification. The chapters on specific mineral metamorphism will undoubtedly be valuable and could be made more accessible if published without the great shell of unverified speculation regarding causes. It seems to be lacking in data by which the origin of the metamorphosed rock, especially of intrusives, can be determined. The volume is

listed as Monograph XLVII of the United States Geological Survey, and may be obtained for \$1.50 upon application to the Director, at Washington, D. C.

The United States Geological Survey, under title of "Mineral Resources of the United States," has issued "The Production of Gold and Silver in 1903." The total statistics of the production of gold and silver for 1903 are furnished, as heretofore, by the Director of the Mint, but the statistical canvass made by the United States Geological Survey resulted in some differences in the distribution of the product among the several States and Territories. During the calendar year 1903 the United States produced 3,560,000 fine ounces of gold, valued at \$73,591,700, a decrease of \$6,408,300, or 8.01%, as compared with the production of 1902. Of the twenty-one States and Territories yielding gold in 1903, eleven showed an increase in production, Nevada leading with an increase of \$492,700, or 17.02%. Alaska, which led in increase in 1902, was second in 1903, with an increase of \$268,900. Kansas and Tennessee, with productions valued, respectively, at \$9700 and \$800, reported for the first time in 1903. The other States and Territories showing gains in 1903 were as follows: Arizona, \$245,300; Utah, \$102,900; Idaho, \$95,400; Montana, \$38,300; Virginia, \$10,400; Washington, \$7700, and Alabama, \$1900. The greatest decrease in production in 1903 was in Colorado, where the production fell off \$5,928,600, or 20.82%. California was second in amount of decrease in 1903, falling off \$687,600. Decreases were also noted in the following States and Territories: Oregon, \$526,500; New Mexico, \$286,500; South Dakota, \$138,700; Georgia, \$35,800; Wyoming, \$35,200; South Carolina, \$21,200; North Carolina, \$20,200, and Maryland, \$2000. The silver yield of the United States for 1903 amounted to 54,300,000 fine ounces, with a coining value of \$70,206,060 and a commercial value of \$29,322,000, a decrease in quantity of 1,200,000 fine ounces, or 2.16%. Of the twenty-one States and Territories producing silver in 1903, eleven showed increased production. Nevada, which led in increase of production of silver in 1902, held the same position in 1903, showing an increase of 1,304,300 fine ounces, or 34.82%. This great increase is due to further developments in the rich Tonopah district in Nye county. The following States and Territories also showed gains in production in 1903 over 1902: Idaho, 652,600 ounces; Utah, 365,100 ounces; Arizona, 344,000 ounces; Alaska, 51,600 ounces; California, 30,700 ounces; Oregon, 24,700 ounces; Texas, 8200 ounces; Virginia, 3600 ounces, and Tennessee, 700 ounces. Kansas reported silver for the first time in 1903, having a production of 97,400 ounces. The greatest decrease in the production of silver in 1903 was in Colorado and amounted to 2,685,800 fine ounces. Alabama, which reported 100 fine ounces of silver in 1902, reported no production in 1903. Other decreases were as follows: Montana, 601,500 ounces; Washington, 324,500 ounces; New Mexico, 276,500 ounces; South Dakota, 119,000 ounces; Michigan, 60,800 ounces; North Carolina, 9900 ounces, and Wyoming, 4800 ounces. The total value of the production of the precious metals by the United States in 1903 (silver at commercial value) amounted to \$102,913,700, a decrease of \$6,501,300, or 5.94% from the yield of 1902.

#### Commercial Paragraphs.

THE S. H. Harmon Lumber Co. have removed their sales office to 328 Montgomery street, San Francisco, Cal.

H. C. MORTIMER JR. has joined the New York office staff of the Crocker-Wheeler Co. He will assist F. B. DeGress, manager of that office, and will succeed A. J. Thompson.

THE Clyde Iron Works, Duluth, Minn., have a valuable testimonial from one of the contractors constructing an eight-story fire-proof hotel at Baltimore. "The Campbell concrete mixer made a record of 205 batches, mixed in nine hours with a one-quarter yard machine." The use of concrete mixers is increasing constantly, and the Campbell mixer manufactured by the above concern is one of the leading makes.

MANAGER CRANK at Johannesburg, South Africa, recently installed a Blaisdel 40x8-foot class A excavator, with conveying system, and a Blaisdel 40-foot class Z distributor at the Robinson Gold Mines, Ltd. He reports that on December 3rd General Manager Meine, R. Matthews, cyanide manager of the Robinson, N. Wilson, chief mechanical engineer for the East Rand Proprietary Mines, together with other cyanide managers and engineers, inspected the work. He states that it was found that the guaranty that it would discharge a vat at the rate of 100 tons per hour, on not exceeding 15 H. P., exceeded this capacity by 100% and reduced the horse power 25% and claims that, as the cost of electrical horse power at the Robinson does not exceed 1 cent per horse power per hour, the per ton cost of handling at 200 tons per hour is .000685 and at 100 tons per hour is .00113. Mr. Crank states that all present were much pleased with the showing made by the machine.

THE Masurite Explosive Co. write that the delays to which their shipments have been subjected in the past two years have been unavoidable and much regretted by them. Their material being new in every sense, the erection of a plant for the successful manufacture has been a more prolonged matter than at first anticipated. Several times it has been necessary to discard certain pieces of machinery and plans of manufacture. Sufficient local trade from their immediate vicinity took up the output of their factory in its incomplete state, and they have been compelled to defer shipments to the Pacific coast until they could manufacture a sufficient surplus to take immediate care of orders from the Pacific coast. They now feel that they have about overcome all possible difficulties, and expect in the near future to be able to fill all of the orders they now have on hand, and make such further arrangements as will provide a convenient source of supply for all users of their material anywhere and everywhere. Geo. W. Myers, San Francisco, Cal., is their Pacific coast representative.



## Trade Treatises.

The Midvale Steel Co.'s catalogue of wearing parts and smelter castings gives sectional views of many of their makes. The Pacific coast office is at 220 Market street, San Francisco, Cal.

Coal mining machinery in all its multiple forms and designs is discussed elaborately in Catalogue No. 52, which is full of interesting data and description, including pneumatic haulage. It is issued by the Ingersoll-Sergeant Drill Co., and will be sent to any address.

Catalogue No. 12 of the Sturtevant Mill Co., Harrison Square, Boston, Mass., is devoted to rock and ore reducing machinery, and beside much that appears in that firm's effective advertisements there is a wealth of detail regarding their roll jaw crushers, balance rolls, screens, blowers, engines and boilers that makes the catalogue a valuable supplement thereto. The treatise deserves the distinction it has received of being copyrighted, but will be sent to any address on request.

From an artistic point of view, the brochure on the Sturtevant Leverless Automatic Motor Car, from the Sturtevant Mill Co., Harrison Square, Boston, Mass., is the finest trade production received this year. Typographically, it is beyond criticism, the reading part of it is finely arranged and the arguments used are most convincing. Anyone who has anything to do in any way, present or prospective, with an automobile should see this booklet, each page of which deserves framing as a work of art.

## Latest Market Reports.

SAN FRANCISCO, January 20, 1905.

### METALS.

**SILVER.**—Per oz., Troy: London, 27½d (standard ounce, 925 fine); New York, bar silver, 60½c, refined (1000 fine); San Francisco, 60½c; Mexican dollars, 51c, San Francisco; 47½c, New York.

**COPPER.**—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37½@15.50; Electrolytic, 1 to 3 casks, \$15.37½; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £68 12s 6d spot per ton.

According to the official statistical circular issued by Jas. Lewis & Sons of Liverpool, the total visible supply of copper in the world Jan. 3, 1905, was 16,734 tons, as against 22,935 tons Jan. 1, 1900, 28,921 tons Jan. 1, 1901, 22,063 tons Jan. 1, 1902, 16,540 tons Jan. 1, 1903, and 13,505 tons Jan. 1, 1904. The present outlook for the metal, both at home and abroad, is good. The producers here have been enabled to gain but little upon the demand. New districts are looked to to increase the output, but a copper mine can not be developed and equipped for large production short of several months, and it often requires several years.

**LEAD.**—New York, \$4.70; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 17s 6d per long ton.

**SPELTER.**—New York, \$6.35; St. Louis, \$6.25; London, £24 17s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

**TIN.**—New York, pig, \$29.25@29.75; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, 32½@35c. London, £131 5s spot.

**PLATINUM.**—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

**QUICKSILVER.**—New York, \$40.00@41.00, large lots; London, £7 15s; San Francisco, local, \$39.00 per flask of 75 lbs.; Denver, \$45.00.

**BABBITT METAL.**—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

**SOLDER.**—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.25c.

**ZINC.**—Metallic, chemically pure, per lb., 50c; dust, per lb., 10c; sulphate, per lb., .04c.

**NICKEL.**—New York, 55@60c per lb.; ton lots, 40@47c.

**ALUMINUM.**—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

**ALUMINUM.**—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

**IRON.**—Pittsburg, Bessemer pig, \$16.85@17.10; gray

forge, \$15.85; San Francisco, bar, 3c per lb., 3½c in small quantities.

**STEEL.**—Bessemer billets, Pittsburg, \$27.00; open hearth billets, \$27.00; San Francisco, bar, 7c to 12c per lb.

**WHITE LEAD.**—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

**LUMBER.**—(Retail): Pine, ordinary sizes, \$24.00@25.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

**NAILS.**—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

**LIME.**—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

**CEMENT.**—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 per bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

**ANTIMONY.**—New York, Cookson's, 8½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

**OILS.**—Lined, boiled, bbl., 55c; cs., 60c; raw, bbl., 53c; cs., 54c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 19c; Astral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c; Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal, iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

**POWDER.**—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

**CAPS.**—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

**FUSE.**—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

**CANDLES.**—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

**CHEMICALS.**—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c per lb.; nitric acid, carboys, 8c per lb.

**BORAX.**—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

**BONE ASH.**—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

**LITHARGE.**—Pure, in 25-lb. bags, 8@9c per lb.

**MOLYBDENUM.**—Best, \$2.75 per lb.

**CHROMIUM.**—90% and over, per lb., 80c.

**PHOSPHORUS.**—American, per lb., 70c.

**SILVER.**—Chloride, per oz., 90c@1.00; nitrate, 55c.

**MAGNESIUM.**—Pure, N. Y., \$1.60.

**MANGANESE.**—Per lb., \$2.75.

**SODIUM.**—Metal, per lb., 50c.

**URANIUM.**—Oxide, per lb., \$3.50.

**MERCURY.**—Bichloride, per lb., 77c.

**TUNGSTEN.**—Best, per lb., \$1.25.

**FIRE BRICK.**—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

**FIRE CLAY.**—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following U. S. patents issued to Pacific Coast inventors:

FOR WEEK ENDING JAN. 10, 1905.

779,403.—JOURNAL BOX—D. Allen, Los Angeles, Cal.  
779,829.—STEP LADDER—W. M. Anderson, Santa Paula, Cal.  
779,682.—VEHICLE—J. E. Armstrong, Santa Cruz, Cal.  
779,755.—CAR VENTILATOR—J. E. Armstrong, Santa Cruz, Cal.  
779,831.—HAT FRAME MACHINE—D. D. Beatty, Grass Valley, Cal.  
779,831.—STAMP MILL MORTAR—M. P. Boss, S. F.  
779,908.—HAND TRUCK—E. J. Bryan, Riverside, Cal.  
779,764.—DRAPERY CORDS—C. A. Burns, S. F.  
779,826.—SOLDERING MACHINE—A. Cerruti, S. F.  
779,643.—SCALE—J. C. Dixon, Hanford, Cal.  
779,915.—RIBBON HOLDER—S. P. Doane, Sacramento, Cal.  
779,773.—FLOOR SWEEPER—Dunaway & Melander, Tacoma, Wash.  
779,917.—DOOR CHECK—O. Ellingen, Santa Barbara, Cal.  
779,693.—PROCESS—F. Ephraim, S. F.  
779,700.—PISTON ROD PACKING—C. P. Fogh, Wadsworth, Nev.  
779,812.—GAS GENERATOR—F. J. Foveaux, Alameda, Cal.  
779,927.—NECK STALL—A. J. Griffith, St. Helena, Cal.  
779,648.—SCRAPER—L. B. Hammond, Portland, Or.  
779,782.—DREDGER—Henderson & Peake, Oroville, Cal.  
779,600.—BILGE BLOCK—J. Hickler, Pasadena, Cal.  
779,783.—CHEESE CUTTER—M. B. Irvine, Longbeach, Cal.  
779,945.—HARNES HOOR—L. E. Johnson, Fresno, Cal.  
779,719.—CAN TESTING MACHINE—P. Kruse, Astoria, Or.  
779,720.—VOLTAGE REGULATOR—O. M. Lacey, Hanford, Cal.  
779,721.—HAMMER—A. E. Leech, Fulton, Cal.  
779,615.—SAND WASHING MACHINE—W. B. Martin, Seattle, Wash.  
779,955.—MORTISING MACHINE—A. W. Miller, Riverside, Cal.  
779,437.—SCATCH BLOCK—G. Nettie, Leaburg, Or.  
779,732.—SCALE GEAR—J. P. Newell, Portland, Or.  
779,854.—MECHANICAL VENTILATOR—E. C. Northrup, San Jose, Cal.  
779,622.—BEDSTEAD—L. P. Pleyer, Seattle, Wash.  
779,964.—RAILWAY TRACK—J. W. Porter, Los Angeles, Cal.  
779,809.—GARMENT—L. C. Sherrick, Lemon Grove, Cal.  
779,888.—TILING—J. Singer, Los Angeles, Cal.  
779,886.—SOLDERING—G. H. Stewart, Los Angeles, Cal.  
779,887.—METAL PLATE—G. H. Stewart, Los Angeles, Cal.  
779,888.—CONDENSER—J. Todd, Seattle, Wash.  
779,892.—MECHANICAL VENTILATOR—W. D. Watkins, San Jose, Cal.  
779,893.—SIGNALLING—W. D. Watkins, San Jose, Cal.  
779,981.—DRAPER—J. C. White, Marysville, Cal.  
779,679.—BLOTTER—E. M. Wilson, Adin, Cal.  
779,680.—STAPLE SETTER—F. Wiseman, John Day, Or.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS U. S. and Foreign Patent Agency, the following are worthy of special mention:

**VOLTAGE REGULATOR.**—No. 779,720. Jan. 10, 1905. O. M. Lacey, Hanford, Cal. The object of this invention is to provide an apparatus by which the voltage of a current of electricity may be constantly and automatically regulated to any desired point. This is effected by a fluid pressure acting in opposite directions upon pistons of different area, the flow of the fluid being controlled by valves actuated directly by the movements of a voltmeter, and the movement of the piston is transmitted directly to the rheostat or other controlling device. There are details of construction adapted to bring about the desired result.

**RECIPROCATING HAMMERS.**—No. 779,721. Jan. 10, 1905. A. E. Leech, Fulton, Cal. This invention relates to a reciprocating or power hammer and means for operating the same. It comprises an improved reciprocating hammer having in combination a base with an anvil block or pillar at one end, a vertical standard at the opposite end and intermediate vertical guides fixed to the base. There are braces by which a die holder or anvil is fixed to the block and the standard, the central block, the central guides and the oppositely fixed standards together and with the base. A handle handle fulcrumed in the standards passes between the guides. There are other details of construction which render the device a distinct improvement in the art and an efficient machine for the purposes required.

**PISTON ROD PACKING.**—No. 779,700. Jan. 10, 1905. C. P. Fogh, Wadsworth, Nev. This invention relates to improvements in packings for piston rods and the like. Its object is to devise a packing particularly adapted for ice machines and marine engines, which will be durable, form a vapor tight joint and which will be self-adjusting and self-oiling. By this improvement a true half joint packing results so that no undue strain is put on the packing, no matter if the rod should operate out of its normal line.

**ATTACHMENTS FOR SEWING MACHINES FOR PRODUCING DRAPERY CORDS.**—No. 779,764. Jan. 10, 1905. C. A. Burns, San Francisco, Cal. This invention consists in a device for forming a tubular flexible fabric and inserting a continuous core at a single operation, said device comprising a fixed exterior tube, a segment of smaller diameter than the interior of the tube, a radially disposed plate projecting between the edges of the segment, said plate having a divergent lower end forming a channel for a core cord, a mechanism to advance the material and return its edges and stitch-forming mechanism for uniting the meeting edges of the material.

**VEHICLE.**—No. 779,682. Jan. 10, 1905. J. E. Armstrong, Santa Cruz, Cal. This invention consists in the combination with the wheel axles and body of a vehicle, of two yoke-shaped levers fulcrumed intermediate of their ends to the vehicle body, with their inner ends continually and substantially central beneath the body, a spring having its ends supported by the fulcrum points of the levers and its central portion underlying and supporting the inner ends of both levers, said levers having the outer ends diverging and bent downwardly and swinging links by which said outer ends are connected with the axles or bolsters.

**DRAPERS.**—No. 779,981. Jan. 10, 1905. J. C. White, Marysville, Cal. This invention relates to improvements in drapers for grain elevators, headers, harvesters and the like, and its object is to provide a simple, economical and novel form of lateral reinforce where the draper cloth or canvas may be protected against wear due from constant contact with the guides in which the edges of the draper run. It consists in various details of construction adapted to bring about the desired result.

## Improved STEEL PIPE

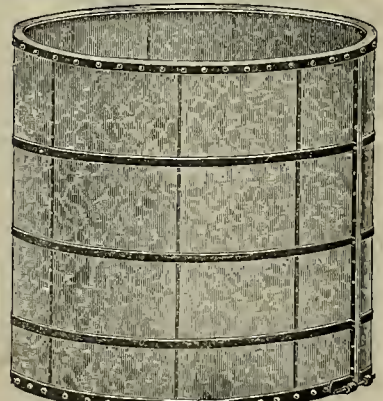
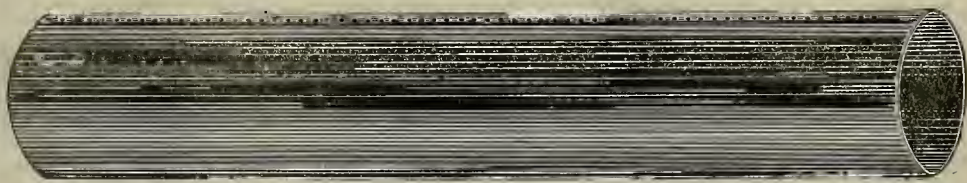
## TANKS

Tanks Shipped K. D.

## Tallerday Manufacturing Co.

DOLGEVILLE, LOS ANGELES COUNTY, CALIFORNIA.

THE TALLERDAY PATENTED STEEL ROLLING MACHINE rolls pipe from 4 inches diameter up to any required size, in 10-foot lengths, from 20-16-14 gauge steel. The advantages of pipe in 10-foot lengths instead of the ordinary 30-inch lengths are obvious—smooth interior increases carrying capacity and decreases friction. Less joints add strength and increase the life of the pipe. One seam in a 20-foot length instead of eight as in ordinary pipe. Use the improved Tallerday Pipe and you will never be satisfied with other makes. Write for Catalogue and Prices.





# MINING AND SCIENTIFIC PRESS

Whole No. 2323.—VOLUME XC.  
Number 4.

SAN FRANCISCO, CAL., SATURDAY, JANUARY 28, 1905.

THREE DOLLARS PER ANNUM.  
Single Copies, Ten Cents.

## The Caving System of Mining.

The caving system of mining is employed chiefly in the Minnesota and Lake Superior iron regions. Under certain conditions the system is also applicable to other metal mines, but it is only of late that attempts have been made in this direction in the West, probably due largely to the decided innovation in methods which it represents, and partly due to the general unfamiliarity with this sort of mining. Mine superintendents who have always handled their mines by applying the various schemes for timbering and filling, commonly known to metal miners, do not at first take kindly to this new idea of the iron men, yet the fact that the caving system is successfully employed in the iron region, and has been in use long enough to prove its adaptability and usefulness over other and far older methods, is a strong recommendation in its favor. There are several methods of applying the caving system, which vary with the physical conditions under which the mine is operated. In most metal deposits the banging wall country is either too hard and firm or too soft to render the employment of caving successful and safe.



Consolidated California & Virginia Mine, Virginia City, Nev. (See Page 54.)

The object of mining by the caving system is to reduce the expenses of mining while affording every protection to the miners and securing all the ore. The latter is not always possible in metal mines, and it then becomes a question whether it is more desirable from the commercial point of view to lose a certain percentage of the ore or to employ a timber system at increased cost per ton while recovering all the ore. This is a matter for the manager to determine. In blocking out ore for stoping, all the dead and preparatory work must be charged against the ore eventually removed, and the

loss of a large tonnage of ore brings the cost of preparatory work per ton of the ore actually extracted to a considerably higher figure. If \$5000 is spent in preparations to make available 50,000 tons of ore, the estimated cost is 10 cents per ton for this preparatory work, but if only 40,000 tons are recovered from this block of ore, owing to unexpected collapse, or other unforeseen difficulty, the cost per ton of the preparatory work is 12.5 cents per ton. The difference in cost between the method employed which resulted in this loss of ore and another method which would have made it possible to have removed all of

the ore may have been as much as 50 cents per ton. Then on the 40,000 tons removed the saving would have been \$20,000. If the ore lost would not net more than this sum, it looks like good business to employ the system which resulted in the greatest ultimate profit. In these days, however, no mine superintendent likes to lose ore which he had planned to get, and he usually devises some method of recovering at least a portion of the lost ore, and then makes such changes as seem necessary, to make the removal of other blocks in the future more complete. This may not necessitate a complete change of system, but the manner of applying it may be changed to advantage. The experience gained in the former operation will usually suggest some other method of attack, and a repetition of the premature cave with consequent loss of ore may be avoided. In many mining regions commercial considerations have compelled mine superintendents to abandon old-time methods for those which were so different from the ordinary practice as to meet with little favor at first, but when their adaptability has been proven others have accepted them as a desirable change from former practices and gladly adopted them.



Belcher Mine, Gold Hill, Nev. (See Page 54.)



The Yellow Jacket Mine, Gold Hill, Nev. (See Page 54.)



Virginia City, Nevada. (See Page 54.)



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IN Germany the coal miners have struck, involving many kindred trades and those depending upon the output of the mines for fuel. It is stated that 300,000 men are involved and it is said to be the most serious industrial difficulty which the government and the country at large has ever been called upon to meet. Thus far there seems to be no difficulty in preserving order, but unless the differences between the miners and operators are promptly adjusted serious consequences are feared.

THE proposition often made, that of filling stopes with tailings from the mills, which are carried into the mines by means of water, is in actual practice in some mines in Europe—in Silesia and Westphalia—but it is doubtful if this practice is suited to wet mines. If the tailings could be controlled and prevented from passing through small spaces, such as commonly occur between lagging, and in many other places in the timbering, it might be available, but the means of doing this without extraordinary expense unsuits it to use in most places. In a wet mine there would be the ever present tendency to run, thus forming a menace to the lives of the miners. It would seem that this use of tailings in a wet mine might result in a run of this fine filling, something akin to the "mud rushes" of the diamond mines of South Africa. In a dry mine, after the water has been drained from the wet material, the danger from a run would probably be lessened to the minimum. The angle of dip of the vein would also probably have an important bearing on the behavior of a mass of sand thus introduced to mine workings. On the whole, at this time the employment of tailings as filling in mine stopes will not meet with favor in America.

## Relation of Dikes to Ore Deposits.

From a careful study of the description of the ore-bearing veins of Cripple Creek district in Colorado, written by Messrs. Lindgren and Ransome, an abstract of which appears elsewhere herein, it is evident that the association of the ore with phonolite and basalt dikes is merely incidental, and that dikes of other kinds of rock would have served the purpose equally well, for in many instances the granite or andesite breccia is ore-bearing along the course of a dike and in contact with it, while the dike itself contains no mineral of value, this being particularly noticeable in the basalt. This simply indicates that the dikes have merely afforded a deep-seated channel or fissure for the passage of mineral-bearing solutions and that these solutions deposited their contents under favorable conditions in those rocks best suited, both physically and mineralogically, to receive them, and generally the dense basic rocks appeared to have been less susceptible to the attack of these percolating solutions than the granite and the breccia. It is true that veins and ore deposits occur in dikes and large eruptive formations in many regions, but it has never been conclusively shown that the values in these veins and deposits were derived from the dike rocks themselves. It must then be assumed that they came from a deep-seated source—probably as deep as that from which the dike itself came, the solutions following along the plane of the fissure formed by the intrusion of the dike. Ore deposits commonly occur at contact of a dike with an older rock, and not infrequently the dike is sheeted by the intense pressure and movement which takes place along the plane of the fissure occupied by the dike—a natural line or plane of weakness. In some such instances ore deposition has taken place in this zone of crushing and shearing within the dike itself. Conditions of this character are not of infrequent occurrence in diorite, quartz-porphyry and other rocks.

The mineralization of this sort is not confined to any particular class of rocks, but basalt seems less suited to the reception of minerals from the solutions containing them than any other rock. It is a fact, long since recognized, that eruptive dikes and masses appear to have a direct influence on the deposition of ore in the rocks they penetrate. This influence of igneous rock on ore deposition is found to operate under a great variety of conditions and to be confined to no particular kind or rock or geological age. Ore is found associated with intrusive rocks in the Archaean schists and from that upward into the Tertiary formations. The intrusive rock may occur as a dike conformable with the enclosing strata, or it may cut across them. It is also often noticed occurring as flat, laccolithic sheets, as at Leadville, Colo., and elsewhere. There are few ore deposits of value which are not connected more or less directly with bodies of igneous rock, but it is not apparent that these igneous masses were the original source of the minerals found in the ore deposits, but rather that their intrusion, as previously suggested, merely opened a fissure or passage way for the ascending currents of mineral-bearing waters which deposited their contents in those places most available for such deposition. The minerals are deposited partly as a filling of interstitial spaces in the rocks, but usually more extensively as a replacement of one or more of the original constituents of the rocks. There are many regions where igneous rocks have been intruded, but where ore deposition seems to have been of limited extent or not having occurred at all, but these places are not common. In well-recognized regions of extensive mineralization, the ore deposition seems to have been more or less erratic, and in some places is lacking entirely, as viewed from a commercial standpoint, though all conditions, physical and mineralogical, are apparently favorable to the formation of ore bodies.

On the outskirts of such districts the mineralization grows less and less pronounced, though small bodies of high-grade ore are of frequent occurrence. The natural laws influencing ore deposition are not as yet well understood. A few facts—the most pronounced conditions—have been noted, and upon these has been built a structure or theory by means of which it is attempted to prove the source and causes of ore deposition, but sufficient has not yet been learned to make the knowledge positive and far reaching. The one who has the best opportunity to

observe the result of nature's forces and apparent vagaries is the miner who, foot by foot, works his way into rocks following his vein by shaft, drift and winze, or stope. He sees the frequent changes—valuable evidence—but he destroys this evidence as fast as he uncovers it. He is not trained usually to view these occurrences from any other than a practical standpoint, and their scientific value in tracing out the processes of nature do not usually appeal to him. If he finds his vein with a clean "let go" in one portion of the mine, but frozen to the walls in another, he merely considers the latter condition as a misfortune which will require more powder to break the ground and additional labor in caring for the ore. He does not seek for a geological, physical or a chemical reason for the change, nor give a thought to the causes which probably produced it. Undoubtedly if trained observers had this daily opportunity, more would be learned of the natural forces and conditions under which ore deposition has occurred. A great deal has already been learned in this direction and the knowledge thus gained is of incalculable value in the business of mining, but without doubt, the next succeeding years will see further advancement in our knowledge of this important subject.

WITHIN the week five more American mining engineers and miners have been murdered by Yaqui Indians in the State of Sonora, Mexico, and that, too, after requesting an escort—which they were assured was unnecessary, as there was no danger. Mexico invites the capital and experience of the United States to assist in the development of the vast resources of that republic, and yet permits a condition to exist which makes it possible for Americans, who are in the peaceful pursuit of their legitimate business, to be shot to death by a few score of Indian desperadoes. It is the candid opinion of every well-informed American in Mexico, and of those who live near the international boundary on this side of the line and who are thus in a position to be well informed as to the facts, that the republic of Mexico could, if so disposed, within thirty days put an end to these constantly recurring massacres of innocent men, both Americans and Mexicans. One of the engineers killed, John K. Mackenzie, had just arrived from Chicago to examine a mine in the mountains back of Hermosillo, and, although it was commonly stated that the Yaquis were on the warpath, the officer in charge of troops at Hermosillo declared that there was no danger. There are still a great many mining engineers and miners in the mining districts of Sonora at this time, and their friends have grave fears for their safety. What steps the Mexican Government will take toward rendering life and property safe in Sonora remains to be seen. The Indians have been raiding that section for several months past, but the efforts on the part of the Government to put an end to it show little of a determination to handle the situation as vigorously as the existing condition appears to warrant.

WITHIN the past three months three separate instances have been recorded wherein coal consumed in firing steam boilers is reported to produce an ash containing gold. One of these is near Florence, Fremont county, Colo., one in Wyoming and the third from the coal mines near Lemhi, Idaho. In the latter instance it is said the ash contains \$2 per ton. In the Crested Butte district of Colorado the coal measures and the coal veins themselves are intruded by igneous dikes and there are many of the geological features present commonly observed in regions of extensive ore deposition, but no gold has as yet been reported in the coal from that district if it occurs. Instances are also reported where the coal is said to contain copper sulphide. The appearance of iron sulphide in coal is of common occurrence—too common in some coals—but although copper is not actually generally known to exist in coal, there seems no good reason why a copper sulphide might not be precipitated in coal as readily as iron sulphide or gold either for that matter. Carbon is a recognized precipitant of minerals from their solutions and if waters carrying gold, silver, copper, iron and other mineral matter in solution penetrates a bed of coal, there seems no good reason why precipitation should not take place in the coal vein as readily as in sandstone shale, igneous or other rock.



## CONCENTRATES.

GASKETS for steam pipe joints may be made from sheet lead, which are superior to those made from rubber or leather.

THE Western Federation of Miners was organized in Montana in 1878, and has since extended to every mining State of the West.

THE first electric mine installation in California was the plant put in near Kelsey, El Dorado county, to run the machinery of the Dalmatia mine. It was destroyed by fire in 1899.

A COPPER HAMMER is a convenient tool about machinery, as a key may be driven as well with a copper hammer as with one of steel, and the former makes no marks on the key.

SOME MILL BUILDERS prefer to build mortar blocks and lower them into the pits, others build them in the excavations prepared for them. There seems little choice in the matter.

THE amount of tungsten annually consumed in Great Britain is stated to be about 1000 tons annually, but this is likely to be increased if the price of the ore is not increased to a prohibitive point.

IN 1895 the United States produced less than one-third of all the aluminum in the world. In 1903 the United States produced nearly one-half of all the aluminum manufactured in the world, the amount being 37,422 tons.

WHERE in a placer the gold follows a narrow pay-streak, and the depth to bedrock is 10 to 12 feet, it may be worked by sinking a series of pits 5 to 10 feet apart, connecting the pits and bedrock by tunneling—the species of mining known as coyoteling.

COPPER ORE in which the sulphide ore (chalcopryite) is associated with iron carbonate could probably be successfully concentrated by roasting sufficiently to render the siderite magnetic and then running the pulverized mineral through an electro-magnetic separator.

THE proper grade for canvas tables concentrating slimes after machines should be determined by experiment. A fall of 1½ inch to the foot gives good results in some instances. Canvas tables should be arranged so that the grade may be changed whenever desirable.

MINE timbers are framed so that adjacent members of the same set or system fit snugly, but no timbers in a mine are joined—that is, provided with tennon and mortise. In the square set the mortise and tennon are merely incidental—a portion of the system—the mortise being formed by the union of four timbers.

PORPHYRY is a term used to indicate a structural condition in a rock. Any rock in which crystals larger than the average of those composing the mass occur is called porphyry. Thus quartz-porphyry, granite-porphyry—a normal granite in which occur large feldspar crystals—hornblende-porphyry, etc., are examples.

NO MINE PUMPS are made which are not damaged by grit and coarse dirt, but some are so constructed as to be superior to others under such conditions. It is less expensive to send up the coarse, sandy dirt in the bucket than to pump it out. The raising of so much grit can be partly overcome by placing a finer screen around the lower end of the suction.

PLATINUM is somewhat heavier than gold. A cubic foot of the former weighs about 1312 pounds. It varies slightly, the specific gravity being 21 to 22. The specific gravity of gold is also variable—according to Dana, 15.6 to 19.3, and 19.33 when pure. All gold, until artificially refined, contains some silver. The specific gravity of silver varies from 10.1 to 10.5.

A SHAFT of two or more compartments, in which ventilation is poor, may have the condition improved by constructing an air-tight partition between two of the compartments. This may be still further improved by the construction of a tower above one of the compartments, which makes one side of the shaft deeper than the other and a current of air is thus induced.

THE only way to get rid of partners in a mining claim who fail to do their share of annual assessment work, or who refuse to pay for their share of the work, is by the means prescribed by law—"advertising them out." One partner may do the work, and then upon failure of the others to contribute their share in cash the proceedings to dispossess them may be commenced.

NATURAL BLUESTONE, or blue vitriol, is known as chalcantith—a natural copper sulphate. It is often seen as an efflorescence on old copper dumps and ore heaps that have been roasted. It is blue to greenish blue, sol-

uble. The taste is metallic and nauseating. It is often in solution in the waters issuing from copper mines. It occurs in large quantities at some mines, notably in Arizona.

IF sufficient water under pressure is not available to lift the gravel from the pit by means of the hydraulic elevator the next best means of raising the gravel to the sluice boxes on the rim of the pit would be by means of a ropeway and bucket or skip operated over the pit. This method is sometimes employed to stack tailings on level ground where they must be removed as they come from the mill.

WHERE the owner of a hydraulic placer mine has failed to perform the required assessment work, and the property is located by another under the law permitting such relocation by reason of forfeiture, any improvements, such as pipe, giants, etc., become the property of the relocater, for the reason that the former owner has no longer a right on the property and may not enter to remove his pipe, etc., being in the eyes of the law a trespasser.

IN the Eastern States coal is found in the rocks of the older formations—Carboniferous, etc. Coming westward, the coal measures are found at higher geological horizons. In the eastern Rocky mountain section the coal occurs in the Cretaceous. On the Pacific coast it is mostly in the Tertiary. In Riverside county, Cal., a coal vein 10 feet and more in thickness is found in Tertiary sandstone not more than 40 feet above crystalline schists and granite.

THE practice of sweating and chiseling mill plates to secure the last available bit of gold deposited on them is a bad practice, as it not only entails additional work, but injures the plates, particularly the chiseling, and moreover the plate requires much more attention, time and labor in dressing and securing a new surface of gold amalgam on the next run, necessitating frequent stoppages of the mill. It is doubtful if anything is really gained in the end by the practice.

THE right of a junior locator to follow his vein in depth beyond the side lines of his location and beneath an agricultural patent has never been positively determined by the Supreme Court of the United States, but Judge Sawyer decided in the case of the Amador-Medana G. M. Co. vs South Spring Hill M. Co. that the mine owner could not take his extralateral right under such circumstances. Before the case reached the Supreme Court, the matter was settled out of court, which leaves the question still open, as far as the highest court is concerned.

THE locator of a mining claim does not lose his right to a claim for failure to perform the assessment work required by law so long as no one relocates the claim, but should a relocation be made by another, because of such failure, the original locator has no recourse. The prior locator may neglect to perform the assessment work for several years and still retain possession so long as he is not disturbed by the entry of another for the purpose of relocation. So long as the first locator remains undisturbed he may resume work at any time and his title will still be good as between himself and the Government.

THERE are numerous instances where steam pumps in mines have been submerged, and which responded when the steam was turned in and promptly began to work. When water rises in a mine and the pumps have to be abandoned, it is a wise plan to open the pet cocks on the steam cylinder. If the weight of the column of water on the piston is not greater than the steam pressure, the pump should start and run smoothly. At a mine in Tuolumne county, Cal., a pump was started in this manner which was submerged under 100 feet of water, and the mine was drained by the pump without trouble.

THE iron ores of the Lake Superior region are handled by means of special cranes, travelers and other mechanical apparatus. It is seldom that these methods are applied to the handling of other metalliferous ores, probably for the reason that usually they are treated in works near the place of their production, while in the case of the iron ores they are shipped often long distances by rail, unloaded into great piles and reloaded into ships, from which they are again moved onto wharves and sent by rail to the smelters. In every instance the ore is taken to the fuel, though less fuel than ore is employed in their reduction.

ONE of the earliest mining camps of California is said to have been the Cargo Muchacho mountains, in San Diego county, about 20 miles from Yuma. At one place it is reported several thousand dollars in nuggets were picked up on the surface. Something similar was found on Rich hill, a few miles north of Wickenburg, Ariz. Near the latter locality nuggets of born silver were found in the wash of an arroyo. Masses of horn silver in placers are of rare occurrence, and could only exist in a country of very slight rainfall, as, owing to the soft nature of the mineral, nuggets would quickly be destroyed by the abrasion of the rocks in a flowing stream.

THE number of cubic feet of ore required to make one ton in place is usually estimated at 13 cubic feet. This

varies somewhat with the character of the ore. A porous "honey-combed" ore, from which sulphides and other minerals have been leached, will require more than 13 cubic feet—sometimes as much as 20 feet or even more—while a heavily sulphureted ore, or one in which occurs a large amount of baryta (heavy spar), or the manganese minerals, rhodonite or rhodochrosite, will require less in proportion to the amount of the minerals of high specific gravity present. It is difficult to estimate the value in precious metals in ores by their "heft," as determined by holding in the hand.

IT is stated that the noted Brooklyn bridge built over the East river, and connecting the cities of New York and Brooklyn, must be rebuilt. The bridge was commenced about 1871, and completed in 1879-80 at a cost of \$15,000,000. It has therefore been in constant service for about twenty-five years. At the time of its construction it was looked upon as one of the most noted works of modern engineering, but has cost nearly \$5,000,000 to keep the great structure in a condition of safety. It is partly due to overloading that this magnificent structure has so rapidly deteriorated, but the most important factor in its destruction is said by competent engineers to be electrolysis. It would seem that some means of obviating this disastrous result may have been applied.

THERE is much diversity of opinion as to the most desirable place for the main shaft of stamp mills. In many instances the shaft is placed on the cam floor in front of the batteries, the belts running horizontally to cam-shaft pulleys. This is done on the front-knee frame type of mill. In other cases the shaft is generally placed back of the mortar either on or beneath the feeder floor. In most mills where the latter is adopted, there is a lack of light and ready accessibility, but this may be remedied by carrying the shaft on a line of concrete foundations raised about 30 inches above the floor. This renders the lining up of the shaft convenient and all repairs, babbitting, etc., can easily be attended to. There are other situations for line shafts, but they possess few, if any, advantages over those above mentioned.

COPPER ORES often occur in flat sedimentary formations in both sandstone and limestone—in sandstone in Paradox district, La Sal mountains, on the border of Colorado and Utah, and in limestone at St. Genevieve in Missouri. These are only two illustrative instances. The conditions mentioned in Mississippi are not an impossible environment for the occurrence of copper ore. It is very doubtful if the assay on the ore mentioned is reliable, as neither chalcopryite nor any other sulphide of copper contains 90% copper. The richest copper ore is cuprite, the red oxide, which contains 88.8% copper. The presence of gold and silver in copper ore is not of unusual occurrence. It is unlikely that the mineralization would extend downward into the underlying strata under the conditions described, although it is not improbable that lower strata may be found mineral bearing, as this is not infrequently the case and such does occur in both of the instances above referred to in Colorado and Missouri.

THE amount of gravel that may be moved daily by hydraulicking is exceedingly variable. There is no constant relation between the quantity of water employed and the amount of gravel moved, even under the same head, with a given amount of water. With given conditions as to the gravel, the amount that may be moved is determined by the quantity of water and pressure available. If either the quantity of water or the head be increased, the volume of gravel that may be moved increases, but the gravel varies greatly as to size of material composing it, and also as to its nature. The gravel banks present every variety of condition from that which is free and readily washed through various stages of cementation to that which is thoroughly compacted and requires blasting to disintegrate it. A stage beyond this and the gravel becomes conglomerate and must be crushed in a mill. Under more ordinary conditions, such as usually obtain in hydraulic mines, the quantity of gravel that may be moved with a miner's inch of water ranges from one to twenty-four cubic yards per twenty-four hours.

A SMALL DRILL BIT will cut more rapidly than one of large cross section, consequently it costs less to drill a given depth of small hole than the same depth of large hole, and this applies to either hand or machine drilling, regardless of the kind of machine. In some ground it is advisable to use a wider bit, as a small hole will not admit of the introduction of sufficient powder to break the hole satisfactorily. If a hole be loaded too near to the collar it is likely that the upper end of the hole will break while the bottom of the hole remains intact, necessitating the reshooting of the hole, particularly if it be a deep one. In deep holes in hard rock it is advisable to employ high-grade powder—70% nitroglycerine—as this is more likely to cause the ground to break than a lower grade of powder. It is never good judgment to overburden a hole. It is better to drill the holes to a lesser depth and to have them break than to be obliged to repeatedly shoot them until the ground is broken. There are certain principles which underlie successful blasting which experienced miners well understand, particularly those who have gained their knowledge by the use of the hand drill, and these principles all miners should endeavor to learn and apply.



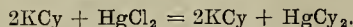
## The Use of Mercuric Chloride in Testing Cyanide Solutions.

Written for the MINING AND SCIENTIFIC PRESS by  
LEONARD M. GREEN.

During the investigation of the constituents of some working cyanide solutions containing copper, the author had occasion to study the reactions of mercuric chloride on copper double cyanides and, incidentally, on zinc double cyanides.

Hannay's mercuric-chloride-ammonia test for cyanide solutions is seldom used on account of the interference of impurities, such as zinc, ferrocyanides, etc.

As is well known, when a pure cyanide solution is titrated with mercuric chloride, potassium chloride and mercuric cyanide are formed.



When the whole of the cyanide has been converted into mercuric cyanide, if the titration is continued, free mercuric chloride is left in solution, and if a suitable indicator is present to show the presence of mercuric chloride in excess, the quantity of cyanide present may be readily determined. Hannay uses ammonia, which forms a white cloud with the mercuric chloride.

In pure solutions this indicator is quite satisfactory, but in impure working solutions it is practically valueless.

An indicator, however, which gives exceedingly good results and a sharp end point is potassium-mercuric iodide, made by adding mercuric chloride to a solution of potassium iodide, till a permanent pink coloration is just produced.

If a pure cyanide solution, to which has been added some mercuric potassium iodide, be titrated with mercuric chloride, when the whole of the cyanide has been converted into mercuric cyanide, the next drop of mercuric chloride solution causes a scarlet precipitate of mercuric iodide. The reaction is exceedingly sharp.

The precipitate is somewhat soluble in and its color is affected by caustic alkalies, but it is not affected by alkaline carbonates or bicarbonates. Consequently, if to a cyanide solution containing alkaline hydrates an excess of sodium bicarbonate be added, together with some potassium mercuric iodide as indicator, the cyanide may be successfully titrated with mercuric chloride.

If zinc-potassium cyanide is also present, the whole of the cyanide in the zinc double cyanide is estimated; but when copper double cyanides are present, only a portion of the cyanide combined with the copper is indicated. If, however, an excess of potassium ferrocyanide be added, the whole of the cyanide combined with the copper is also determined.

The cyanide combined with copper and with metals forming double cyanides similar to copper double cyanides, although not indicated by the ordinary silver nitrate test, may therefore be determined by the following method:

### DETERMINATION OF CYANIDE IN COMBINATION WITH COPPER.

**STANDARD SOLUTIONS.**—Silver Nitrate: Dissolve 13.05 gms. of pure crystallized nitrate of silver in distilled water and make up to 1 litre.

1 c.c. of this solution = 0.01 gm. KCy.

**Mercuric Chloride:** Dissolve 10.422 gms. of pure mercuric chloride in distilled water and make up to 1 litre.

1 c.c. of this solution = 0.005 gm. KCy.

**Potassium Mercuric Iodide Indicator:** Dissolve 1 gm. of potassium iodide in distilled water; add mercuric chloride solution till a permanent pink tinge is produced; then add 2 gms. of potassium ferrocyanide and 2 gms. of sodium bicarbonate and make up to 200 c.c.

Use 10 c.c. of indicator for each 10 c.c. of cyanide solution tested.

**TESTS.**—I. Take 10 c.c. of solution to be tested; add a slight excess of caustic soda solution and a little potassium ferro cyanide, together with a few drops of a strong solution of potassium iodide. (If ferro-cyanide is not added the result is apt to be slightly high where much copper is present.) Titrate with silver nitrate solution till a permanent yellowish cloudiness is formed. Disregard any slight whitish cloudiness sometimes occurring previously.

Result = 'a' c.c.

II. Take 10 c.c. of solution; add 10 c.c. of potassium mercuric iodide indicator; titrate with mercuric chloride solution till a permanent reddish coloration is formed; disregard any purplish coloration sometimes occurring previously, which is due to the precipitation of copper ferro-cyanide.

Result = 'b' c.c.

Then the cyanide combined with copper

$$= \left( \frac{b}{2} - a \right) \% \text{ (considered as KCy).}$$

N. B.—When silver is present in any quantity, it causes the color at the end point to be a yellowish-red to orange, instead of red.

In solutions containing zinc, another curious reaction occurs which may sometimes be found useful.

If a solution of potassium cyanide and potassium zinc cyanide, to which is added a large excess of potassium ferro-cyanide and sodium bicarbonate, be titrated with mercuric chloride solution, when two-thirds of the potassium cyanide has been taken up by the mercuric chloride (viz., when the  $\text{HgCy}_2$  and  $\text{KCy}$  are in the proportion of  $\text{HgCy}_2$   $\text{KCy}$ ), the further addition of mercuric chloride causes a white cloud of a ferro-cyanide precipitate, which the author believes to be a double ferro-cyanide of mercury and zinc. This precipitate is soluble in potassium cyanide, but is not soluble in  $\text{HgCy}_2$ ,  $\text{KCy}$ , nor in alkaline carbonates and bicarbonates.

This reaction suggests a method of determining zinc, which the author believes may sometimes be useful where a rapid determination is required.

**DETERMINATION OF ZINC.**—III. Take 10 c.c. solution; add a large excess of potassium ferro-cyanide and of sodium bicarbonate; dilution barely affects the result; then titrate with mercuric chloride solution until there is a permanent milky cloud formed; towards the finish add the mercuric chloride 2 drops at a time, waiting about twenty seconds between each addition.

Result = 'c' c.c.

This result represents two-thirds of the potassium cyanide present. Therefore, the potassium cyanide equals  $\frac{2}{3}c\%$ .

By Test I the potassium cyanide + the potassium zinc cyanide =  $a\%$ .

Therefore, the potassium zinc cyanide =  $(a - \frac{2}{3}c) \%$  and the zinc =  $\left( \frac{4a - 3c}{16} \right) \%$ .

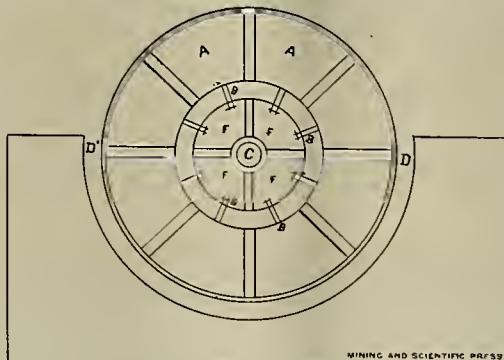
The reactions given in this paper are only some of the more interesting reactions of mercuric chloride with cyanide solutions, and the author believes that this solution might often be used with advantage in place of or in conjunction with silver nitrate solution.

City of Mexico, Jan. 18.

## A Continuous Slime Filter.

Written for the MINING AND SCIENTIFIC PRESS by  
ALGERNON DEL MAR.

The vacuum slime filter herewith sketched is an outline for a continuous filter, one that is continuous in operation, and, although not actually tried, the inventor believes he sees his way to overcome the mechanical difficulties. This filter, worked in conjunction with the steam agitator illustrated some months ago, should make an ideal process.



Proposed Continuous Filter.

The filter wheel A C is made in one casting an inch thick, planed on both sides, divided into eight or more compartments, containing filtering space of 1 square foot on each side, or a total of 16 square feet of filtering surface in the one unit. The filtering spaces are covered with the filter cloth and thin sheet of perforated steel over this, so that the compartments outside will be even (plane) enough to use a scraper and spray to remove the accumulated sludge. Each compartment, A A, has a valve, B B, opening into the chamber, F, with a spring that can be tightened to any required tension. The hollow cylinder, C, the axis of the wheel, is connected with a vacuum pump which exhausts the air from F and through the valves B from the compartments A. This filter wheel revolves at any desired speed in the annular grooved receptacle E, the groove D being kept full of slime. As the wheel revolves the receptacles A A dip beneath the slimes. The vacuum then begins to act, the liquid filtering through the cloth and the solid matter clinging to the surface. When any one compartment has traversed the space from D to D' the economical limit of filtering is over, and as the compartment rises out of the slime the sludge is automatically scraped off and washed with a jet of water under pressure. As soon as a certain amount of sludge is swept off the air enters A, and unless the valve is automatically shut the vacuum in the other compartments would suffer. The sheet iron or steel that completely covers the space F has eight small stuffing boxes, through which project eight rods, one for each valve, so that

as soon as the compartment revolves out of the slime the rods are automatically pushed in, completely closing the valves, keeping them closed until they dip under the slime again.

A modification of the idea above outlined would be to have the vacuum boxes on the periphery of the wheel instead of on the side, or they might be on both.

## Gypsum and Its Manufacture.

Gypsum is a hydrous calcium sulphate. It is a compound of calcium and sulphuric acid combined holding water of crystallization. The percentage of these components by weight is calcium 32.5, sulphuric acid 46.6, water 20.9. The principal varieties are selenite, a transparent kind occurring in plates and sheets, often of considerable size; satin spar, a fibrous variety with silky luster; alabaster, a compact, dense variety, and an earthy dull variety often containing impurities. It is often associated with rock salt, due to the fact that both salt and gypsum are residual deposits left by the evaporation of sea water; the salt, being precipitated more readily, is generally found beneath the gypsum layers.

Gypsum occurs in seventeen of the United States, and is abundant in the localities of its occurrence. It is used in the manufacture of plaster of paris and as land plaster. In the process of manufacture of plaster of paris the gypsum is calcined, in the process of which, when sufficient heat is applied, the water of crystallization escapes as steam, the crystals are disintegrated, and the mass boils vigorously. When the temperature reaches about 132° C. the boiling ceases and the material settles down in the kettles, and it may then be seen that the material has decreased in volume by loss of water. When the temperature lowers to 177° C. the mass is removed from the kettles, the temperature being checked before all the water is driven from it. The process of manufacture varies in the different works in the United States, though the methods are about the same. The difference lies chiefly in the character of material treated. The earthy gypsum requires less machinery than the gypsum rocks, as the latter requires crushing machinery which may be dispensed with in treating the former; the earthy gypsum is also generally less expensive to mine. It is taken from the beds by whatever means seems best applicable. In some instances it may be shoveled or scraped up into wagons. In others it must be plowed up or loosened. Rock gypsum often requires blasting. The impure kinds or portions are used for land plaster. The rock material is delivered in lumps at the mill when it is passed through crushers. It is next ground into coarse grains between buhrs, or rolls similar to those used in flour mills. Other types of machinery are sometimes employed for accomplishing these results. From the granulating machines the gypsum is conveyed to the calcining kettles, which are cylindrical in form and placed vertically in brick work. The heat is applied beneath, and usually passes upward through pipes or flues which are arranged within the kettle. In the process of cooking the gypsum is added gradually, the mass being stirred by revolving arms, which prevents the material on the bottom from burning and also aids in an even distribution of heat. When the gypsum begins to cook, the water which is driven off causes it to boil vigorously. The boiling ceases at a temperature of 132° C. The mass settles in the kettle as a result of the loss of water. As a higher temperature is reached boiling recommences, but is much less vigorous than before. At 177° C. the valve at the bottom of the kettle is opened and the mass of pulp is drawn off, and is cooled on a floor or in a bin. The temperature is noted during boiling by means of a thermometer, but the operator soon becomes expert enough to judge the degree of heat by the appearance of the boiling gypsum. The boiling must not be carried so far as to expel all the water, for if this occurs the plaster will not set readily. Good plaster of paris depends upon the presence of a small amount of anhydrite, around which crystallization begins and is continued until the entire mass is "set." After cooking and cooling the gypsum is passed through fine screens, and is sometimes even reground before sacking. The oversize from the screens is usually mixed with fresh material and recalcined. There are a few plants employing rotary-cylinder furnaces similar to those used in making clinker for Portland cement, but these are of special construction. Superheated steam has also been experimentally used in cooking gypsum, but this, evidently the coming process, has not as yet been perfected in all its details. Although gypsum occurs in scores of places throughout the West, one of the most interesting occurrences is that in western South Dakota and eastern Wyoming, about the Black Hills uplift, where it is found in beds often over 40 feet in thickness, and of dazzling whiteness, resting upon the bright red shales and marls of the Triassic. Where erosion has not removed the Jurassic rocks the gypsum is overlaid by buff and greenish colored sandstones. This combination of colored rocks and the green foliage of trees and grass gives a picturesqueness to the scenery rarely found elsewhere. The valley in which the gypsum beds occur com-



pletely encircles the hills, and the deposit is almost continuous for over 300 miles. There are several plants in the Hills, for the manufacture of plaster of paris, land plaster, etc. These are at Sturgis, Spearfish and Hot Springs. Commercial success in the manufacture of the raw material is largely dependent upon cheap transportation, which is not always available in the districts where gypsum is most abundant.

### A Redwood Forest.

Although nearly all of the forest trees of the West are used in mining, including most of the conifers, the redwoods, which grow so abundantly and of such magnificent size in California, are used to only a limited extent in mine timbering. In the New Almaden quicksilver mines in Santa Clara county, Cal., redwood was used extensively for mine timbers for many years, but lately their use has been discontinued for Oregon pine and other pine timbers. The accompanying illustration is characteristic of a California

required to furnish forth a summer lounging place or a dining room for the adjacent habitation. These facts argue the difficulty of clearing farms in the redwood region, but of that we shall speak more in detail upon a later occasion.

These redwoods should not be confused with the *Sequoia gigantea*, or "Big trees" of California, although the former are also of the same genus—*Sequoia semper virens*. These two species are the only kinds known. The *semper virens* is found in the Coast Range only, and the *Sequoia gigantea* in the Sierra only, occurring in a series of isolated groves from Calaveras county on the north to Tulare county on the south. These mammoth trees are only equaled in their great height by some varieties of the eucalyptus of Australia.

### Strength of Timber Treated With Preservatives.

With the increasing use of timber, preserved in one way or another against decay and fire, it is important to determine the effect which the preserving

processes have upon the strength of the preserved timber.

This general plan was pursued at the timber-treating and testing station at St. Louis in accordance with the following outline:

(1) To determine the effect of the preliminary processes, such as steaming, on the mechanical properties of the timber.

(2) To determine the effect of the preservatives on the strength of timber, eliminating the effect of the preliminary processes.

In order to determine the effect of these factors, the programme was divided into two parts—part 1, the effect of the preliminary process, and part 2, the effect of preservatives.

The effects of the preliminary process were determined only on loblolly pine—a variety common in the Atlantic and Southern States. Both green and seasoned timber was used in determining the effect of preservatives. The preservative fluids investigated included only creosote and zinc chloride.

In making comparative strength tests of treated and untreated timbers it is necessary to eliminate, as far as possible, the variations due to the great differences in quality of individual pieces of wood.



View in Bohemia Grove of Redwoods, Near Guerneville, Sonoma County, Cal.

redwood forest, this view being of the Bohemia Grove, near Guerneville, Sonoma county, and is reproduced from an excellent photograph taken by Mrs. W. A. Turner of Guerneville. One of the peculiar features of the redwood forest is its practical indestructibility by fire.

Though fires may rage through the undergrowth, the trees are not destroyed, though the lower bark may be often sadly disfigured by surface burning. But this indestructibility of the redwood and its resistance to decay makes the clearing of redwood lands difficult and expensive, while at the same time it renders the forest self-perpetuating, in spite of even wasteful lumbering. Second growth of redwood from the stump is clearly seen to be of immense age. More recent second growths show how the older instances came about. The primeval trees were of enormous size and the growth from suckers around their rooting, therefore, described a circle of great diameter. The succession of grand trees around a common center forms an enclosure of considerable area, and many such an area serves as a retired recreation retreat or as an auditorium for forest oratory, or sermonizing, or dancing, as the tastes of the visitors may incline. As there are very large circular enclosures, so there are smaller ones, marking the sites of smaller central stumps, and the second growth is so rapid that not many years are

process has upon the strength of the preserved timber. Many engineers believe that creosoted timber is more brittle and less capable of withstanding strains than the same timber before being treated with creosote. This is particularly true with bridge timbers and piling.

Actual tests are necessary to determine what relationship exists between the preservative process and the strength of the timber. Most of the tests hitherto made with preserved timber were made by comparing results of tests on treated sticks with results on untreated sticks. In many instances these turned out in favor of the untreated timber. The reason why such tests are unfair to the preservative is that in the process of preservation two factors enter: (1) The actual process of impregnation with a preserving substance, and (2) the preliminary processes of steam seasoning, in the majority of treating plants in the United States. A piece of timber subsequently treated with creosote may be steamed to such an extent that the timber becomes exceedingly brittle. This, obviously, will be the fault of the steaming and not of the creosote.

Timber preservation divides itself broadly into three stages: First, the preliminary preparation; second, the actual preservative process; and third, the treatment of timber following preservation. The final strength of the timber may be influenced mate-

This was accomplished in this case by using 11-foot timbers cut at the same time from one forest site. In testing the influence of preliminary processes of seasoning, a 3-foot section was cut from one end of each timber and sawed up into test pieces, which furnished a basis of comparison between (1) the results of tests of these "control" pieces, and (2) the results on test pieces taken from the remaining 8-foot section after the latter had been subjected to the various preliminary seasoning processes in the treating cylinder.

In testing the effect of preservatives themselves, the entire 11-foot timber was subjected to the preliminary seasoning processes, after which a 3-foot section was cut from the end of each timber. The 3-foot section, thus having been subjected to the preliminary seasoning processes, formed a basis of comparison with the remaining 8-foot section, which was treated with the preservatives. In this way the separate effects of the preliminary processes and the effects of the preservatives could be isolated and determined.

Because of an apprehension that defects of brittleness of treated timbers might not be evidenced by the ordinary tests under slowly applied loads, provision was made for both static tests and impact tests. The test pieces were subjected to cross bending strain, compression along the grain under both static and impact conditions, and under shearing



parallel to the grain and compression at right angles to the grain under static conditions. The data taken include the moisture conditions, specific gravity, and rate of growth. During the treating operations, records were kept of the temperature to which the timbers were subjected at all stages, the amount of preservatives absorbed, as indicated by gross weight and subsequent chemical analyses of the test pieces.

Ordinarily, the strength tests were made immediately after treatment in the cylinder. In order, however, to determine what weakness might be introduced by changes in the physical conditions of the preservatives in the wood through lapse of time, a complete series has been set aside for subsequent operations. An additional set of test pieces has been loaded with different percentages of the strength, as exhibited under the ordinary tests, and this load allowed to act for long periods of time, the deflections being measured from day to day.

While this programme is not sufficiently advanced to allow the drawing of final conclusions, yet the preliminary results are fairly indicative of what may be expected. It is found that the steaming process weakens the resistance of the wood fiber to both static and impact loadings. It may be stated that this diminution of strength is very nearly in direct proportion to the length of time that any given steam pressure is applied. The diminution of strength was found to be 25% after a pressure of twenty pounds was applied for ten hours to green loblolly pine, and 10% when a pressure of twenty pounds was applied for four hours. This diminution of strength increased very rapidly when the pressure rose above twenty pounds, and amounted to about 25% when a pressure of fifty pounds was applied for four hours.

It will be easily seen that when the conditions of time and pressure are made very severe, the conditions prevailing in the pulp mill industry will be approximated. Evidently, it is well to avoid when possible the use of these preliminary steaming operations in the wood preserving industry.

With relation to the effect of preservatives themselves, the latter is distinct from the preliminary process. It may be said that the treatment with zinc chloride does not seem to further reduce the strength of timber beyond the effect of the steaming process. This might have been expected when it is considered that the strength of the zinc chloride solution ordinarily used does not exceed 2½%. The strength of timber that had been treated with the 2½% solution of zinc chloride, after having been steamed four hours at twenty pounds pressure, was the same as that of timber which had been steamed without the subsequent application of zinc chloride. The same statement may be made of timber treated with an 8½% solution of zinc chloride. It may be that subsequently the crystallization of the zinc chloride will weaken the wood fiber. This remains to be determined.

The effect of the creosote appears to be the same as that of an equal amount of water in weakening the fiber. That is to say, the strength of creosoted timber is that of green timber. The difference is that while green timber gains strength upon seasoning, the creosote oil remains in the wood, and, it appears from analysis of a pile thirty-five years old, that the oil remains in a liquid condition. Consequently, comparison between seasoned timber and creosoted timber will always result to the disadvantage of the latter, as far as its strength is concerned. In the case of creosoted wood, it also remains to determine what changes in the wood fiber take place through lapse of time in the presence of creosote oil.

It is expected that a bulletin will be issued by the Bureau of Forestry upon the results of these investigations when the tests are completed. This bulletin will also contain the results of the investigations to determine the best methods of preserving wood, so that the maximum impregnation may be obtained with the least expenditure of oil per cubic foot of timber.

### Remedying Unsanitary Conditions of Mines.

Written for the MINING AND SCIENTIFIC PRESS by  
MATT. W. ALDERSON.

The Governor of Montana in his message to the Legislature now in session says:

"Information has just reached me through the inspector of mines that the sanitary condition of the Butte mines is very bad. Whatever is necessary to remedy this should be promptly supplied."

The Governor quotes extensively from the report of the inspector, who says:

"In the Butte mines conditions have become so bad in a sanitary way that a reference to the statistics of mortality in that city will show that at least 100% more men die from diseases caused by bad sanitary conditions in the mines than result from all mine disasters."

The report recites that in the city above ground excellent sanitary conditions exist, but that for the 5000 or 6000 men laboring underground, who from the nature of things cannot come to the surface to attend to Nature's demands, and who use abandoned drifts, crosscuts and such other places as are con-

venient, a condition exists which demands a remedy. He recommends a law to provide for sanitary regulations in mines.

I presume this matter has received some consideration from every person who has worked in a mine. Many consider it but a moment, accept the situation and go ahead. I know I have wondered many a time what would be best and have then done what was not best. One day, however, I happened to notice that droppings left on the surface near a shaft where work was being done had disappeared. I became interested and observed that the droppings of one day had invariably disappeared by the next. I continued my observations to ascertain what animal could be the scavenger, and was led to the conclusion that it was a mountain rat and that the rat came from among those making their home in this old shaft, in which work had been renewed. Later, when an abandoned level was used in a mine, I made repeated observations and noticed that the excrement always disappeared the first night and the only sign left was a few granular droppings of the mountain rat.

I had always looked upon the mountain rat as a nuisance and was ever ready to wreak revenge upon him for borrowing candles from me when opportunity offered. But instead of being an enemy I now found that he was a friend, ready to perform a service for me without money and without price which it would be almost impossible for me to get done otherwise. We have been friends from that day, and if he chews a candle end off for me during the night, or if he comes down near where I am working and helps himself to a drink from my pail of drilling water, as I have had him do many a time, he is very welcome.

Since the above experience I have never hesitated to let my men make use of any part of a mine accessible to the mountain rat, having implicit confidence that our faithful scavengers would do even better service for us than the fowls do for the beasts of the field. And I venture to assert that men working in a mine where mountain rats make their home may violate what would be considered the most essential of sanitary regulations with impunity.

The remedy for imperfect sanitary conditions is obvious. Make the mine so that mountain rats may exist in proportion to the number of men employed. They will do better service than any system of sewerage or any lot of patented contrivances that may be put in to take their place.

### The Power Drill Sharpener.

Written for the MINING AND SCIENTIFIC PRESS by T. H. PROSKE.

When the modern air drill first came into use the single bit was replaced by the cross bit, owing to its greater cutting capacity and its lesser liability to follow slips and seams in the rock, which often resulted in the loss of a hole on account of being crooked.

The cross bit was forged from the octagon or round bar at that time in general use. To make these cross bits it was necessary to upset the bar to about twice its normal size for a distance of from 6 to 8 inches at one end previous to forming the cross. This was done in order that in redressing the bits a long stock of cross was available to work on. After this stock had been worked down, the bar was again upset as at first. This process of upsetting, especially by hand, was very expensive, as it was very laborious. In some of the larger mines in Michigan a large bolt-upsetting machine was installed to do this upsetting, which materially reduced this expense. The general use of these machines was not possible on account of their enormous cost. To overcome this, the drill steel makers began rolling out cross-formed bars of steel, to be cut into the desired lengths and then welded onto octagon or round bars. While this welding was expensive, it was cheaper than upsetting the bar, as was at first done, and this type of drill is in general use in the Rocky mountain mining districts.

When drill sharpening machines first made their appearance, one of the conditions met was that no two mines used exactly the same shape of drill. The only way that I can account for this is that the Creator did not make any two blacksmiths alike, and therefore each smith had his own peculiar form of drill. This difference in ideas often resulted in more or less trouble in the mine by the mixing of drills made by different smiths, and to overcome this a very wide range of gauge was adopted; in some cases a starter drill would be 3½ inches wide, and then they would drop ¼ inch in gauge as the lengths would change, and often the bottom of a 6-foot or 8-foot hole would be more than 2 inches in diameter. Into this hole so much powder was rammed that, instead of merely breaking the rock, it was pulverized to a sand. One-half the charge would have accomplished the desired result.

By the use of a power drill sharpener the gauge of the drills can be reduced to a size that is consistent with what is really wanted, and at no time should the gauge of the drill vary more than ¼ inch. As these machines positively gauge all drills regardless of who runs them, it is possible to use smaller drills, and in this way put down from 25% to 40% more holes than with the same air consumption.

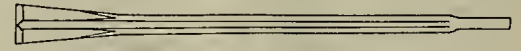
Practice has determined the fact that where 1½-

inch powder is to be used, the bottom of the hole need not exceed 1½ inches. If the rock is so tough that 40% powder will not break it, then it is cheaper to increase the strength of the powder than to increase the size of the hole.

As the hardness of rock varies in the different mining districts, so must the drill vary to conform to these conditions; no matter what the depth of the hole is to be, the bottom should not exceed 1½ inch diameter for 1½ inch powder; if the hole shall be from



Type of drill used in Rocky mountain mining districts. Cross-formed bar welded onto octagon bar; shank forged to small bushing.



Type of drill used in Michigan copper and iron mines. Long cross upset in bolt upsetting machine from octagon bar.



Type of drill as made with a Power Drill Sharpener. Cross upset 3 inches long from round bar; no forging down of shank, as chuck bushing is large enough to take the full size of bar, the most economical drill that can be made.

8 to 9 feet deep, and four lengths of drills will put it down, then the starter drill should be 1½ inch wide as made by the machine, the second drill should be 1½ inch wide, the third, 1½ inch wide, and the fourth, 1½ inch wide. These drills will usually cut ¼ inch larger than their gauge, but should the rock be so hard that eight lengths of drills are required to put down a 9-foot hole, then the starter should be 2½ inches wide, the rest to follow at a ¼ inch drop in gauge. In a number of tests made it has been found that machine sharpened drills lose their gauge about one-half as fast as hand sharpened drills, so the smaller the starter drill the less the drill has to cut, and the faster it will go into the rock. The reducing of the size of the drills can only be safely done where a machine is used for sharpening.

These are some of the economies already accomplished; there are more to follow, especially where the cross-formed bars are welded onto the octagon bars; by the use of the power drill sharpener this welding is not necessary; neither is it necessary that the octagon bar be upset from 6 to 8 inches for stock; it is only necessary that there should be enough cross to sustain the bit, and usually 3 inches is sufficient for any size drill. The modern drill sharpener will easily forge this amount of cross and bit on the end of a bar without any hand work whatever, and, after having once forged it, it will maintain it until the bar is used up.

In some mines it has been found advisable to increase the size of the bushing in the chuck of the rock drill to take the steel without the necessity of forging down the shanks. This lessens the number of broken shanks, and even when a shank does break, the drill can be put back into the chuck at once without having to forge it down. In this way by using a power drill sharpener it is possible for one man to sharpen from 200% to 300% more drills than he can sharpen by hand, and on account of their accuracy in gauge they can be made smaller, and in this way the capacity of the rock drills underground is increased from 25% to 50%, and by dispensing with the welding of drills and shanking them, the work on the drills themselves in the shop is reduced fully 50%. Machine sharpened drills will not stick, or cause rifled holes.

### A View of the Comstock Lode.\*

Unusual attention has been attracted to the Comstock Lode at Virginia City, Nev., by reason of the engineering problems being solved there in the unwatering of the south, or Gold Hill, end of the great



Overman Mine, Gold Hill, Nev.

lode. For five years the Comstock Pumping Association has been successfully lowering and controlling the water of the central group of mines, by means of

\* See illustrations on front page.



a hydraulic elevator operating in the Consolidated California & Virginia shaft. The success in handling the large volume of hot water encountered in these mines has recently determined those interested to undertake the unwatering of the Gold Hill section in either a similar manner or by means of electrically driven pumps. In addition to these mechanical problems, the geological possibilities of the lode in the way of the development of new bonanzas is again affording much food for speculation in consideration of the recent developments in the Con. Virginia and the adjoining Ophir mine. Some very good ore has recently been found on the 2300 level of the former, though its extent is wholly undetermined. In the Ophir, a rich vein is being developed, the principal cutting in it at present being a winze, which is said to be wholly surrounded by the new ore. Although there are a great many shafts on the Comstock, from 2000 to over 3000 feet deep, there has been comparatively little exploration below the 2000 level and this mostly along the foot wall, and what may yet be found by deeper exploration is wholly an unknown quantity. It is noteworthy that the new discoveries are well into the hanging country, farther than ore has ever previously been found. There is still abundance of low-grade, but payable, ore in the upper portions of some of the mines, and also a great deal known in depth which would also probably yield a profit, if existing conditions could be changed somewhat, so that mining could be carried on in a manner similar to that practiced elsewhere, and at no greater cost, except as it is influenced by the great heat of the lode, which is one of the most important factors in the cost of working. The accompanying illustrations are of some of the surface works of important mines of Virginia City and Gold Hill, and are published through the courtesy of the Reno Chamber of Commerce, being from its recently issued interesting book, "Greater Nevada."

### Firing Blasts by Electricity.

The use of electrical fuzes is rapidly superseding the old cap and fuse method of firing blasts. It is therefore desirable that the details of this kind of blasting should be more generally understood.

In order to economize explosives when firing a long line of holes, it was once necessary to drill a hole, fire it, then select the most advantageous point for the next hole to be drilled, and so on. The time lost by workmen in moving tools and retiring from the vicinity of the blast was enormous, especially when a shot happened to miss fire or did not explode promptly, necessitating a long wait before it was safe to approach the shot and examine it. Before the days of electrical fuzes a great many expedients were tried in order to overcome these troubles and to find some way to fire all the holes in a blast line at, as nearly as possible, the same time—for it was generally understood that a great deal more work could be done by a given quantity of explosive if all the shots could be fired at the same time than could be done if even a small fraction of a second should elapse between the explosions. These attempts at simultaneous firing were crude and, compared with modern methods, ineffective, and serve only to illustrate the need of a better method.

With electrical fuzes, however, it is easy to fire a line of 10 or 100 holes at exactly the same time—in fact, it is difficult to do it otherwise—and that this simultaneous explosion of a long line of shots will do the greatest possible execution needs no argument (Fig. 1). Furthermore, special methods of loading, which would be impossible with common fuse, are easily carried out by using electrical fuzes. The safety of the electrical method deserves equal consideration. With a blast to be fired by common fuse there is always the chance that a piece of fuse left burning in the hole after springing may set fire to the explosive and cause a premature explosion. The statistics of accidents which have occurred in the use of explosives show a great many cases of this sort. Then there is the old story of the blaster, who thought the fuse had gone out, and approached the blast to examine it about the time it exploded. With electrical fuzes accidents of this kind are eliminated. Not only does the blaster know just when the explosion is to take place, but he is able to retire the workmen to a safe distance with the least possible loss of time. If by reason of some improper connection a blast fails to explode, he can at once disconnect the blasting machine and set about an examination of the wires to locate the trouble, and can feel perfectly safe in doing so. In tunnel work the safety, speed and certainty of electrical firing places it so far in the lead as to leave no choice. There is no long wait for the blast to "go," and no doubt as to whether or not it exploded. The absence of smoke from the burning fuse is no small item. In excavating for buildings in crowded cities—and even here dynamite is now indispensable—the blaster can choose the most favorable moment for firing even a single shot, and is relieved of the fear that some one may approach the blast while the fuse is burning. He can clear the way for the blast, fire it and at once send the workmen back to their places.

The blaster who undertakes this work will require

a blasting machine, some heavy leading wire, connecting wire, insulating tape, and one electrical fuze for each hole to be fired.

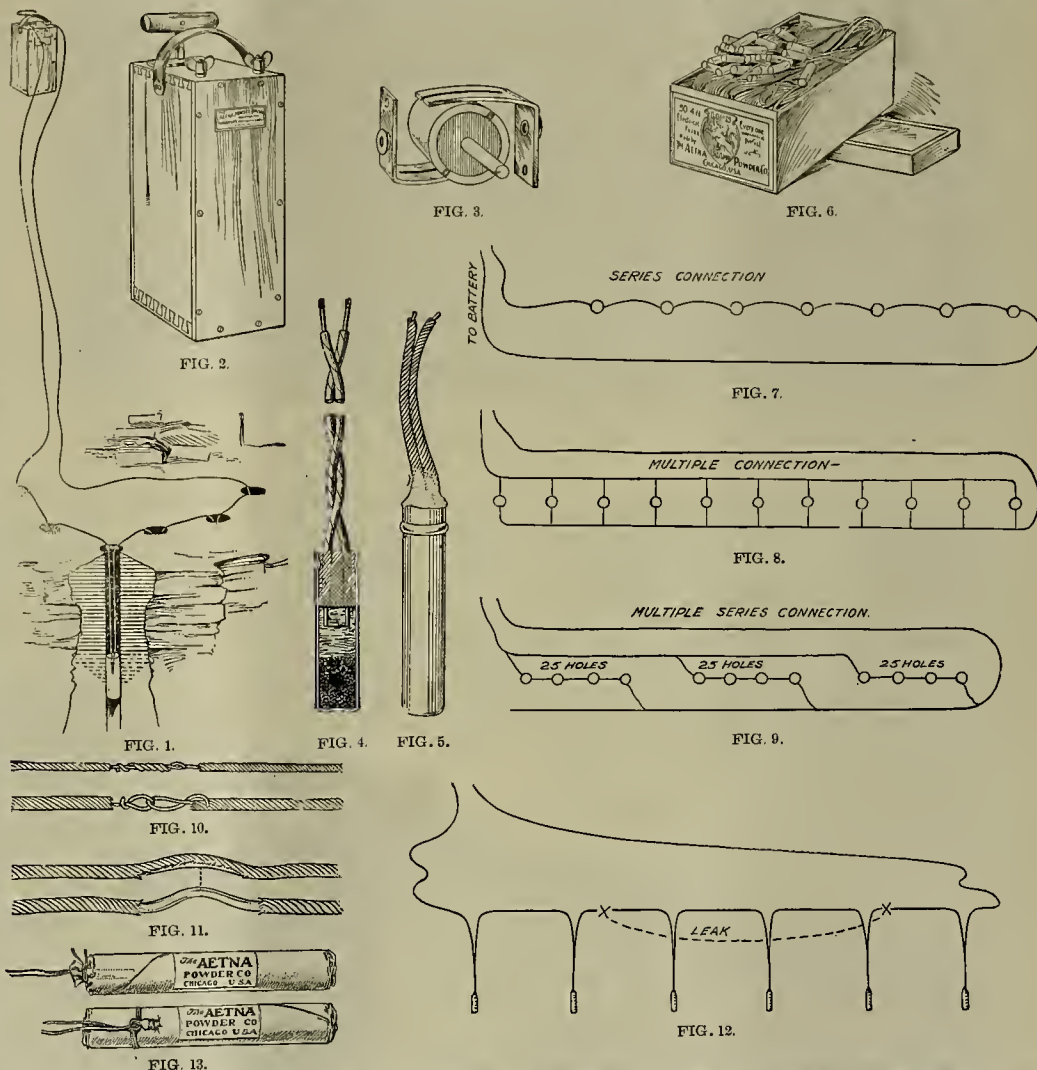
Of blasting machines there are several kinds and sizes. The machines operated by a crank are usually of too small a capacity for anything except shooting wells or firing small blasts. Besides this there are two well-known types of machines, the "push down" and the "pull up," the terms being indicative of the manner of operating when firing. There is little difference between them—each being good—but the push down kind is perhaps the better known (Fig. 2). A No. 3 machine when in good condition will fire 20 to 30 fuzes at a time; a No. 4, 40 to 50 fuzes. Beyond this capacity there is but one machine made, the No. 5 pull up, which will fire 75 to 100 fuzes at a shot. If the blaster expects regularly to fire 25 to 30 fuzes at a shot, he would do well to choose a No. 4 machine, for the greater capacity lessens the chances of a misfire and a single miss might cost a great deal more than the difference in price.

Some of the push down batteries are made with three connection posts instead of two, the idea being to divide the blast into two circuits. Practical blasters have found this to be a useless complication, as

after which it is a good plan to carefully coat the coils with shellac.

Leading wire is used for connecting the battery to the electrical fuzes placed in the blast line. It is a heavily insulated copper wire put up in coils of 500 feet. Instead of this is sometimes used a double wire called a "blasting cable," which is somewhat easier to handle. This comes in coils of 250 feet. Connecting wire is a finer wire used for connecting between the holes. It is usually put up in 1 and 2-pound spools. Insulating tape is needed for protecting bare connections made underground or lying on wet ground.

Fig. 4 shows an electrical fuze in section. Into a blasting cap are inserted two copper wires held in place by a sulphur plug. The ends of the copper wires are bridged by a very fine and delicate wire, which is heated to combustion by the current of electricity which is forced through the circuit by the blasting machine. In the best makes of fuzes this bridge is made of platinum. The bridge is imbedded in finely chopped guncotton, which in turn communicates the flash to the charge of fulminate. Guncotton is used for priming because it is the most stable explosive known, besides lessens very materially the danger of breaking the delicate bridge. Some mak-



evidenced by the fact that nearly all such machines after having been used awhile, are found to have had the third post knocked off. The benefits of the three wire system are largely imaginary, while the trouble the third wire gets you into is real.

These blasting machines are simple dynamos and do not require to be recharged, as many suppose. With decent care they will last indefinitely. Good care counts for a great deal with them. They should be kept in a dry place, if possible, and the commutator and brushes frequently sandpapered. Don't use emery. No oil should be used on the commutator, but if it appears to be cutting, the armature should be taken out and the commutator turned and filed smooth and lubricated with graphite or by rubbing on the lead from a common lead pencil. The brushes should bear so tight that a decided resistance is felt when turning the armature with the fingers (Fig. 3). If the armature continues to spin after the completion of the stroke of the rack bar, the brushes do not bear down hard enough. The little slots in the commutator should be scraped out to free them from particles of copper which tend to short circuit the current and very greatly diminish the power of the machine. If the blasting machine is exposed to rain or stored for a long time in a very damp place, the coils of wire forming the fields and armature will take up enough water seriously to interfere with the working of the dynamo. The coils should be thoroughly dried by setting the machine on top of a boiler or in some place where it will thoroughly dry,

ers use gunpowder or other explosives instead of the guncotton. The copper wires leading from the cap are covered with two windings of cotton and further insulated by a tarry composition, which prevents short circuits being formed by moisture in the ground. The insulation is not strictly waterproof—in fact, such insulation is not required, although fuzes with rubber-covered wires will be made when the blaster thinks he must have them. The cost of the rubber-covered wires is necessarily very much higher than the regular insulation. Fig. 5 shows a cap ready for firing.

The standard fuzes are made with wires of various lengths—from 4 to 30 feet.

Consider the delicate nature of the bridge, and it will be apparent that the fuzes should be handled carefully. Roughly pulling the wires or tying a "half hitch" in them to fasten the fuze to a dynamite cartridge is very likely to put an unequal strain upon the wires which might dislocate the plug, break the bridge and not only cause that particular fuze to miss fire, but all the other fuzes in the circuit as well. Another reason for handling carefully is that the cap contains a charge of explosive which is very much more powerful than dynamite, and is extremely sensitive to heat and shock. As an illustration of its explosive force, a cap placed on end on a 4-inch pine board and fired will blow a hole through the board as clean as a rifle bullet would make.

The caps used in making the standard strength fuzes (sometimes erroneously called single strength)



are much more powerful than XXXX blasting caps. The standard strength fuzes are of ample power to explode any grade of ordinary dynamite. The double strength fuzes contain a stronger charge than even the XXXXX caps, and are intended to be used with gelatin dynamite, which is more difficult to explode than ordinary dynamite.

When all the holes to be fired at one time are loaded and tamped, separate the ends of the two wires in each hole and, by the use of connecting wire, join one wire of the first hole with one of the second, the remaining free wire of the second with one of the third, and so on to the last hole, making a continuous connection between the holes and leaving a free wire at each end.

There are several methods of connecting the wires. The common way and the best for all around use is the "series" connection, shown in Fig. 7. The blasting machines are designed and wound especially for this style of wiring, and the best results are obtained by its use. With the blast connected in this way, about one volt is required for each fuze and a current of two or three amperes is usually sufficient to fire a large blast.

Another is the "multiple" connection (Fig. 8), which requires approximately one ampere for each fuze to be fired, while a comparatively low voltage is sufficient. This is the best method to use when firing with the current from an electric light plant, for then there is an abundance of current—usually too much. Such a current turned on to a blast arranged in series does not work well, probably because it fires some of the first fuzes before sufficient current can reach all. With a multiple arrangement the current is bound to be evenly distributed. On the other hand, a blasting machine which would fire fifty holes in series could not be relied on to fire more than five arranged in multiple, because the quantity of the current would not be sufficient.

For very large blasts a combination of the two methods works nicely. Fig. 9 shows a good way to connect 100 to 125 holes.

It is necessary in making connections to have the wires well cleaned and twisted together tightly, after the manner shown. Merely hooking the wires together, as shown in lower wire (Fig. 10), is bad practice, and will surely lead to trouble, for it makes a very poor contact, and, besides, the wire is apt to slack up and leave no connection at all. Bear in mind that a considerable portion of the surface of the wires should be in actual contact—an area at least as large as the section of the fuze wire—and this can only be accomplished by twisting the wires together for at least  $\frac{1}{4}$  inch.

The charges having all been connected, as directed herewith, the free wire of the first hole should be joined to one of the leading wires, and the free wire of the last hole with the other of the two leading wires extending to the battery. The leading wires should be long enough to reach to a point at a safe distance from the blast—say 250 to 500 feet.

Connecting wire should be of the same size as the fuze wire. Leading wire should be at least twice as large.

To fire the blast with a push down machine, lift the rack bar to its full length and push it down with all force, bringing the bar to the bottom with a solid thud. With a pull up machine, stand with one foot on each of the projecting irons at the bottom of the box and, with the handle at its lowest point, pull up the rack bar with all possible speed. The current developed by either style of machine depends on the speed with which the handle is operated.

In tamping, material should be selected which cannot injure the wires. Large pieces of crushed stone often catch the wires and kink them. This may break the wires or scrape off the insulation and leave an opening for a short circuit. Should it be necessary to make a splice which would come below the surface, the bare connection should be covered with insulating tape. Connections between holes should be raised above the surface by resting the adjoining insulated wire on a block of stone or supporting it by a stick stuck in the ground after the manner of miniature telegraph poles. If connections are likely to touch bare ground, they must be covered with insulating tape. If by chance the wires should be grounded at some point, or imperfect connection has been made, the blast will usually fail to fire and the blaster must set about correcting the wiring. It sometimes happens that because of careless wiring two or more "grounds" may have been made, robbing some of the fuzes of sufficient current to cause them to miss.

Then, again, the insulation might have been peeled from the wires of one of the fuzes by careless tamping, making a partial short circuit, as shown in Fig. 11.

If but one-quarter of the current should leak across the short circuit, the remaining three-quarters passing through the cap might not be sufficient to heat the platinum bridge before the other fuzes in the line were hot enough to fire and break the circuit, as shown in Fig. 12. This kind of misfire most often happens with a weak battery. A battery giving a current considerably in excess of that actually required would in all probability fire such a fuze in spite of the leak.

With electrical fuzes to fire the shot, the way is easy for all sorts of special methods of loading which

would be impossible with fuses. Local conditions may be met by double charging holes with different grades of dynamite, and by other methods which will suggest themselves to the ingenious blaster. Suppose you have a high face with soft rock top and very hard rock at the bottom, a not uncommon condition. You have but to put some 60% dynamite in the bottom of the hole, a fuze and some tamping; then, say half way up, some 40% dynamite containing another fuze, and more tamping. In this way the bottom may be blown out clean and broken up properly, while the charge of 40% farther up will be sufficient to move the softer rock. After a little experimenting the strength of the two charges may be so regulated that the bottom will be blown out in advance of the top, the 60% being quicker than the 40% and the soft rock above pretty thoroughly mixed with the harder rock below by simply falling straight down upon it. This method is very effective in mixing the different kinds of clay often found in the upper and lower layers of a clay bank.

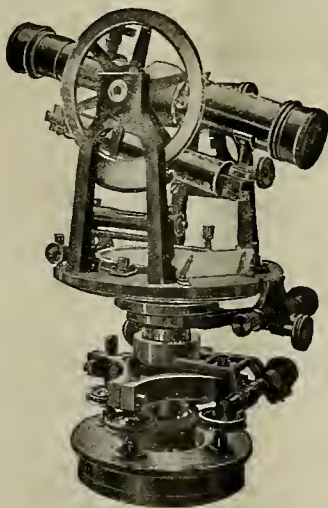
In attaching a fuze to a dynamite cartridge a hole should be made in the cartridge with a piece of wood, the cap inserted and tied securely in place with a string. This is more work than the other methods, but in the end it pays.

The practice of sticking the cap in the side of a cartridge and securing it by a half hitch of the wires is prolific of misfires and should be severely condemned. Such a half hitch very often results in peeled insulation and either leaves the wires in actual short circuit, or, disturbing the insulation, leaves an opening for water to complete the short circuit. A great many cases have been noted where wires have been actually broken by this half hitch. And, further, the sharp bending of the wires shatters the sulphur plug in the cap. This permits a strain directly on the fine platinum bridge and often breaks it. Disturbing the plug in this manner also leaves an opening for the water to enter the cap.

The cost of an electrical fuze is more than the cost of a blasting cap and sufficient common fuse to fire the same shot. But if you will take into consideration the time of workmen saved in the one case and lost in the other; the loss from misfires which could have been avoided; the saving of explosives resulting from simultaneous firing, which most authorities put at not less than 25%, the advantages are overwhelmingly on the side of the electrical way, to say nothing of the satisfaction which comes from the use of such a speedy, safe and reliable means of firing blasts.

### A Compact Transit.

The transit illustrated herewith weighs six pounds, the tripod five pounds. It is 8 inches high, with an outer diameter of the horizontal limb of  $4\frac{1}{2}$  inches. The achromatic telescope is  $6\frac{1}{2}$  inches in length and has a power of eighteen diameters. It has a patent screw focusing arrangement, rack and pinion move-



A Compact Transit.

ment, and the telescope axle is fitted with clamp and tangent screw with opposing spring. The verniers are fitted with ground glass reflectors. It is manufactured by Queen & Co., 1006 Chestnut street, Philadelphia.

In the distillation of zinc from cyanide precipitate it is proposed that the precipitate should be dried, mixed with lead and charcoal, and retorted. If mercury be present, it can be recovered at the beginning of the distillation, the zinc being later condensed as dust suitable for further use as precipitant. The residuum containing the gold and silver should be smelted with lead in a furnace like the ordinary cupellation furnace, iron ore and silver being added in such proportions as to give a fluid slag, from which the lead separates. The slag should be skimmed off and the lead cupelled in the usual way, the resulting litharge being used in the next operation.

### Tellurium in the Hauraki Goldfields.\*

Written by F. B. ALLEN.

New Zealand has often been quoted by metallurgists and others as one of the countries in which tellurium is found, and locally it has been recorded that appreciable quantities of tellurium have been met with in the Thames and surrounding districts. However, specimens containing tellurium which have been obtained on this field have not been preserved, and their scarcity to-day points to the fact that tellurium is not here abundant.

To ascertain its distribution, analyses and assays have been made by the author on a large number of ores, the results of several of which are given below.

In sampling reefs for assay purposes, one of the troubles is the difficulty of obtaining representative samples, especially where the gold is coarse and patchy, and in many cases it is practically impossible to obtain a correct valuation of the Thames reefs from assay samples. The only reliable method is to actually treat a large quantity of the ore, and value the slimes and tailings by assay. There is, however, no criterion that the next 100 tons will yield results at all corresponding with those of the previous 100 tons.

Similar trouble has been experienced in the present tests, and it must be conceded that, although several analyses from a mine may each show no tellurium, this substance may be present in other parts of the mine. On the other hand, a single analysis will sometimes establish the fact of its existence in the ore.

As the economic importance of the occurrence of tellurium in a mining district is intimately connected with the amount of bullion found near or associated with it, and would be practically nil if the tellurium were not found along with the gold and silver in the reef, the method adopted for the identification of tellurium on the Hauraki Goldfields has been to obtain and analyze the rich sulphide ores in each district. For if the tellurium were not found in conjunction with the richest values it would probably be absent from the mine, or, if present, would have little prejudicial effect on the recovery of the bullion in the milling process.

Although unable to obtain any samples of ore containing a high percentage of tellurium in this district, the author has from time to time come across evidences and traces of this substance, and has located it in a number of mines and localities where hitherto it had not been recognized.

In every instance in which tellurium was found there was so small a percentage, and it was associated with such a comparatively large amount of base sulphides, that it was impossible to determine in what combination the tellurium existed, and consequently no attempt is here made to name the different tellurium-bearing minerals on the peninsula. It is, however, noteworthy that copper was present in greater or less quantity in every ore in which tellurium was detected.

Tellurium has been found by the author at the following places:

Coromandel.—Quartz containing 25% mispickel. Assay: 200 ounces gold per ton; 90 ounces silver per ton. This ore contained a little tellurium, the amount of which was not estimated. A considerable quantity of the ore was roasted without loss of bullion.

Tapu.—Quartz containing dense iron and copper pyrites. Assay: 24 ounces gold per ton; 250 ounces silver per ton. Analysis showed the presence of 7½ ounces of tellurium per ton, i. e., approximately, 3% of the bullion in the ore.

Waiomo.—Small sample of white quartz from the Gem mine, showing sulphides of silver, but no visible gold, along a dark band. Assay: 15 ounces gold per ton; 600 ounces silver per ton; 12 ounces tellurium per ton, equal to 2% of the bullion.

Waiomo.—Monowai ore containing quartz, sulphides of iron, copper, lead and zinc, with a trace of antimony. Assay: 4 ounces gold per ton; 30 ounces silver per ton. Tellurium was present in small quantity, amounting to less than 1% of the bullion.

Broken Hill, Waiomo.—White quartz with blue-black specks containing iron and copper pyrites and sulphides of silver. Assay: 2 ounces gold per ton; 40 ounces silver per ton. The ore contained 4 ounces of tellurium per ton.

Similar samples containing copper pyrites from Tararu creek contained a small amount of tellurium, and Maratoto ore yielded a little. One sample from Maratoto taken many years ago gave a much higher percentage.

The following indicate the nature and value of some of the samples in which no tellurium was detected:

Waihi.—Dense iron pyrites containing quartz and copper pyrites. Assay: 24 ounces gold per ton; 760 ounces silver per ton.

Jubilee.—Friable quartz in cavities of hard white quartz. The ore contained blue veins of sulphide of silver as well as copper carbonate. Assay: 8 ounces gold per ton; 150 ounces silver per ton.

Komata.—White quartz containing a black band, in which were copper minerals and gold. Assay: 600 ounces gold per ton; 160 ounces silver per ton.

Karangahake.—Concentrates from the Woodstock.

\* Abstract Trans. Australasian Inst. Min. Engrs.



Assay: 2 ounces gold per ton; 256 ounces silver per ton. Although the mine occasionally produces a little cobalt and nickel, none was found in these concentrates.

Great Barrier.—White quartz containing iron pyrites and the blue veins of sulphide of silver. Assay: 2 ounces gold per ton; 200 ounces silver per ton. A considerable amount of selenium was detected in this one, but no tellurium.

In connection with this, the sulphur-dioxide method of the separation of selenium and tellurium was not found satisfactory, and ferrous sulphate was used as a means of separation of the two substances.

Thus tellurium has in these experiments been found along a line stretching from Coromandel to Maratoto, but nowhere to the east. Numerous samples from Tairua, Waitekauri, Waihi and other mines of Karangahake failed to show any tellurium, so that it may fairly be said that in the ore coming to grass from these districts at the present time there is little or no tellurium.

That analyses of rich ores from every part of the district have shown tellurium in only a few instances, and then only in small quantities, indicates that this substance, during late years at any rate, has not been mined along with the auriferous quartz in sufficient quantity to exercise a prejudicial effect on the extraction of gold.

## The Mines of Cripple Creek, Colo.\*

NUMBER II.

Written by W. LINDGREN and F. L. RANSOME.

STRUCTURAL CHARACTER OF DEPOSITS.—With few exceptions the ore bodies, of whatever shape, are casually connected with fissures, and most of them constitute fissure veins of various types. The fissure system of the district appears to radiate from a point near the northern limit of the volcanic area. In the eastern part the prevailing directions are northwest or north northwest, gradually changing to a northerly strike in the southern portion and to predominant north-northeast or northeast courses in the western side of the district.

Individual veins are rarely over half a mile in length, but linked-vein systems often extend for a

by replacement and recrystallization of the country rock—usually granite. These types are not always sharply distinct, but may be connected by deposits of intermediate character.

All the ore bodies, of whatever type, exhibit certain common features which serve to distinguish the deposits of Cripple Creek from those of most other mining districts. In the first place, the actual openings in the rocks available for the deposition of ore are, as a rule, remarkably narrow. In the second place, the amount of material carried in the mineralizing solutions and deposited as gangue and ore minerals was comparatively small. In consequence of

SHEETED VEINS.—The mineralized sheeted zones constitute the most characteristic deposits of the district and occur in practically all the rocks, although particularly common in breccia. They consist of a varying number of narrow, approximately parallel fissures, together composing a sheeted zone that may range from a fraction of a foot to 50 or 60 feet in width. Such uncommonly wide zones of fissuring, however, can usually be resolved into two or more sheeted zones lying so close together that the whole constitutes for practical purposes a single ore body. Usually the sheeted zones are from 2 to 10 feet in width. In other cases the fissures may be very



Vindicator Mine, Cripple Creek, Colo.



El Paso Mine, Cripple Creek, Colo.

mile in the same direction. The dip is generally very steep. The movement along these fissure planes appears in all cases to have been very slight. The fissures charged with ore are sometimes simple veins with one fracture plane; much more commonly, however, they are composite veins or lodes which consist of several closely spaced and frequently linked fissures, all more or less ore bearing. A better expression for this structural type as it appears in Cripple Creek is the term "sheeted zone."

TYPES OF DEPOSITS.—The most important types of auriferous ore bodies occurring in the district are:

1. Tabular in form and strictly following simple fissures or sheeted zones. A subtype comprises lodes in which the sheeted zone follows "basalt" or phonolite dikes.

2. Irregular bodies adjacent to fissures and formed

these two conditions, the district contains no such massive veins, solidly filled with quartz or other vein minerals, as are characteristic of the San Juan region in Colorado or the mother lode region in California. Even the small fissures of the Cripple Creek district are rarely completely filled, but exhibit a characteristic open or vuggy structure. Where the fractures are of unusual width, or where the rocks are extensively shattered, as in the Midget and Moose mines, the small volume of available vein matter is particularly noticeable. The walls of such fractures and the fragments of the shattered rock are usually merely coated with a thin deposit of quartz, fluorite and other minerals. As the rich tellurides were usually among the minerals last to form, and are particularly abundant on the walls of the vugs, it is probable that had quartz, fluorite, or other gangue minerals been more abundantly deposited the ores would have been of much lower grade.

numerous, the rock for a foot or more in width being divided into thin parallel slabs, while on each side of this medial portion the fissures become farther and farther apart as the lode grades into the normal country rock of the vicinity. In still other cases there may be two main fissures, 3 or 4 feet apart, accompanied by more or less irregular fracturing of the intervening and adjacent rock. As a rule the fissures are mere cracks, showing no brecciation, slickensiding, or other evidence of tangential movement of the walls. Usually the tellurides are exclusively confined to the narrow fissures and cracks, and do not, in this type of deposit, in any sense constitute a replacement of the country rock. The rocks in the vicinity of the fissures are partly replaced by dolomite, pyrite and a little fluorite; the telluride ores, however, do not share this propensity, but coat the open fissures, associated with a little quartz and fluorite. The fissures are not, in general, planes of

\* Abstract Bull. 254, U. S. G. S.



faulting. Appreciable movement has undoubtedly occurred in some instances, but the displacement probably rarely exceeded 1 or 2 feet.

Although found most abundantly in the breccia or trachytic phonolite, sheeted zones and single fissures are often well developed in the granite, as in the El Paso, C. K. & N., and Gold Coin mines. While in some of these lodes the ore minerals are as plainly confined to the fissures as in the breccias, in other cases the ore to some extent permeates the granite alongside the fissure, this constituting a deposit intermediate in nature between types 1 and 2. They also frequently follow phonolite dikes, the general tendency of these dikes to develop a platy parting parallel to their walls being particularly favorable to the production of a well-defined sheeted zone when the direction of fissuring happens to coincide with that of the dike.

The metasomatic alteration accompanying these sheeted zones is surprisingly slight, and consists of a partial replacement of the breccia, phonolite, trachytic phonolite, or "basalt" by dolomite and pyrite accompanied by a small amount of sericite and a little secondary potash feldspar. But even in the most altered rock the newly formed minerals rarely form more than a small percentage of the rock mass. The alteration in granite exhibits a somewhat different phase, described in a subsequent paragraph.

Not all the sheeted zones carry ore, nor is the ore of a productive sheeted zone necessarily coextensive with the fissuring. The ore occurs in pay shoots up to 2000 feet in length and 1000 feet in depth, but usually very much smaller than is indicated by these limits. The boundary between the ore and the barren portions of the lode can be determined, as a rule, only by assays. No single factor that can account for the localization of the ore in these pay shoots has been discovered. In some mines the pay shoots occur where the lode is intersected by cross fissures; in other mines no such relation exists. In some mines ore occurs where the fissures pass through phonolite dikes; in other mines the lode, elsewhere productive, becomes barren when it enters phonolite; while in still others the presence of the phonolite has had no apparent influence upon ore deposition. It thus appears that the occurrence of two or more favorable factors is necessary to determine the position of a pay shoot in a lode. The discovery of these factors is one of the unsolved problems connected with the Cripple Creek district.

(TO BE CONTINUED.)

## Methods of Renewing Old Timbering at the Dives-Pelican Mine, Silver Plume, Colo.

NUMBER II.

Written by J. F. McCLELLAND.

**REOPENING CAVED DRIFTS.**—This work is more difficult and dangerous than that of replacing old timber. The simplest case occurs when the back of the drift will stand unsupported for a short time. Enough of the broken ore is removed to make room for a new set, which is then put in place, braced and lagged. The top lagging poles are put on first. In many instances, however, the ore is dry and shows a strong tendency to run. It then becomes necessary to resort to "spiling."

The timbering is first brought up as near as possible to the caved portion of the drift in the manner already described, and the forward ends of the lagging poles are blocked up on the last set as shown at a, Figs. 4 and 5. The blocks used are sawed from lagging poles and are about 6 inches long. Smooth lagging poles, 4 or 5 inches in diameter, and roughly sharpened at one end, are used for spiling poles. The point of one of these is held against one of the blocks (a, Fig. 5) and the pole is driven forward with a sledge. This, of course, knocks out the block, but the spiling pole supports the lagging above. All of the blocks are replaced in the same way, the spiling being driven ahead into the caved material as far as possible. Wedges (b, Fig. 6) are inserted to keep the spiling at a proper inclination. Under the protection of these spiles some of the caved material is removed, the spiles are driven farther ahead, and a false set (c, Fig. 6) is erected from 2 to 3 feet ahead of the main set. The work then has the appearance shown in Fig. 6. Next the spiles are driven home and the new set is erected as shown in dotted lines. The next spiling poles can then be started under the cap of the false set and over the cap of the main set.

In carrying out this work care must be taken to keep all of the spiling poles even and at the same inclination. They should be given sufficient pitch to insure plenty of room above the main set for the insertion of the next series of spiling poles. The poles themselves must be cut longer than the ordinary lagging pole. Where the sets are placed 4 feet 8 inches center to center, a 6-foot spiling pole is not too long.

The presence of large rocks may cause a great deal of trouble. Where possible the spiling poles are driven over a large rock. If this can not be done,

the rock must either be split up with a gad or a sufficient amount of the caved material removed from underneath to allow it to fall.

As a general rule, the walls of the drift do not require spiling and they are lagged in the ordinary way, after the roof is completed, and the new set in place. If necessary, they may be spiled in a similar manner. For the sake of clearness, the side lagging has not been shown on the drawings.

An interesting variation of this method is shown in Fig. 7. Here the back of the drift caved unexpectedly just after a new half set had been put in place and lagged. The caved material ran freely and spiling became necessary. The pressure of the overlying

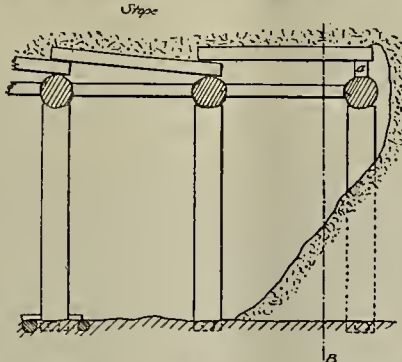


FIG. 4.

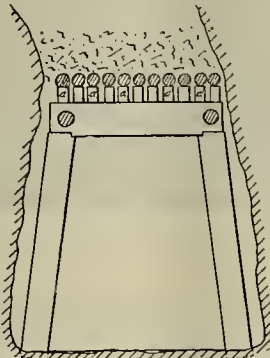


FIG. 5.

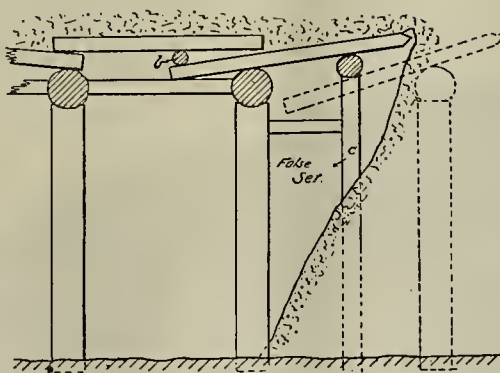


FIG. 6.

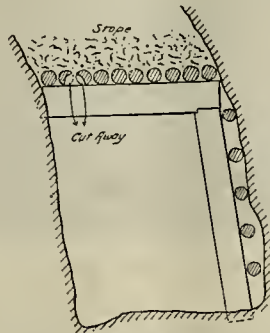


FIG. 7.

ing ore was so great, however, that the ends of the lagging poles could not be raised to give room enough to start spiling poles. This difficulty was overcome by cutting away a portion of the ends of two adjacent lagging poles, directly over the cap. A spiling pole was then driven through the hole formed in this way (Fig. 7). The next lagging and the remaining portion of the first lagging were then cut away in the same manner, and a second spile was driven in alongside the first. By repeating the process spiles were driven in across the whole roof. These spiling poles were cut so long that their rear ends projected behind the cap, and supported the forward ends of the lagging, thus avoiding any weakness due to cutting the lagging away where they rested on the cap.

The same device is resorted to in repairing caves of one or two sets in heavy ground.

The method of spiling as above described answers satisfactorily for the ordinary conditions encountered, but occasionally ground is met with which runs so freely that the face of the drift must be supported before room enough can be obtained to erect the new set. Breast boards are then used to hold back the face, as shown in Figs. 11 and 12. In a particular case observed the hanging wall was strong enough to carry timber in a hitch, while the foot wall was much softer. Spiling poles 7 feet long were driven in and a false set (e, Fig. 9) was erected as usual. As the poles were driven past the false set no attempt was made to excavate the whole face—only a small portion of the caved material directly under the spiles was taken out. A 6-inch timber (a, Figs. 9

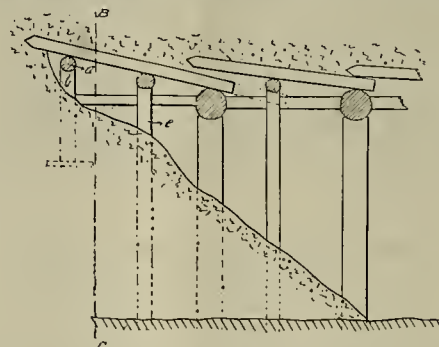


FIG. 9.

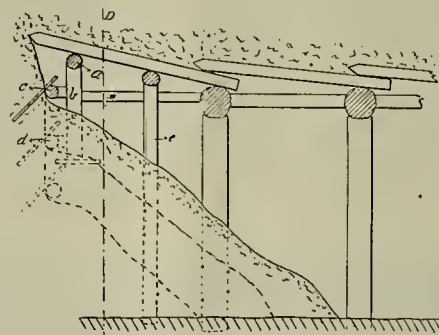


FIG. 11.



FIG. 10.

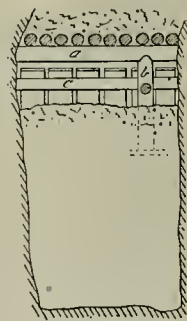


FIG. 12.

and 10) was then put in place, with ends supported by hitches cut in the walls. Near the foot wall end a post b was set up and given a firm footing on a 2-inch block imbedded in the ore. This post was braced back to the false set. More of the caved material was then removed and the pole c, Figs. 11 and 12, was put in and braced back to the post b. The ends of this pole also rested in hitches. Breast boards of 1-inch plank, 10 inches wide and 24 inches long, were driven into the caved ore behind the pole c, as shown in Figs. 11 and 12. These boards served to support the face sufficiently to allow excavation to proceed to the point d, where a second pole and series of breast boards could be put in.

At this point a second post similar to b, but longer, was set up under the timber a, near the center of the drift, and the poles c and d were braced to it. The post b was then removed and a longer one substituted. By repeating these operations the whole face of the drift was opened up and the new set was erected just in front of the breast boards.

The presence of old and decayed timber in the caved ore is often of material assistance in preventing the ore from running while carrying out the work. Obviously the method may be modified for use where both walls are too soft to carry timbers in hitches.

It is impossible to estimate the cost of doing work like spiling and breast boarding, owing to the great irregularity in the conditions encountered. A set may sometimes be put up in a single day, while another will take a week for its completion. In all cases, however, this work is much more expensive than the replacement of old timber.

(TO BE CONTINUED.)

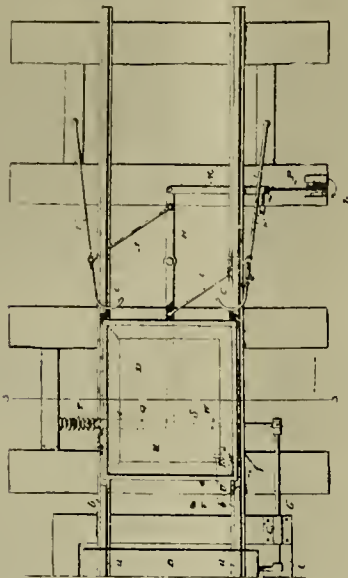


# Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 17, 1905.

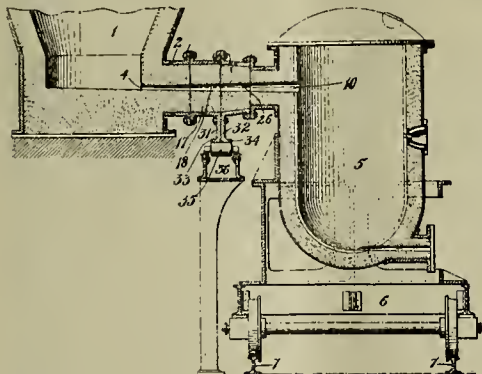
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

**SAFETY DEVICE FOR MINE SHAFTS.**—No. 779,535; N. W. Dickerson, Derwent, Ohio.



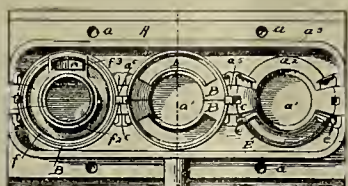
Combination with elevator shaft, landing, and elevator car movable in shaft; of movable device for stopping car and preventing passage of same toward shaft, means for moving device to and normally holding it in position to bar passage of car, trigger arranged to be engaged by elevator car, connection between trigger and movable device for moving latter by former; connection comprising parts one of which is movable out of engagement with other to break connection, and movable device arranged in advance of first mentioned movable device and adapted when operated by car to move movable part of connection out of engagement with complementary part of connection.

**SMELTING FURNACE.**—No. 779,953; A. E. Manchester, Newburg, N. Y.



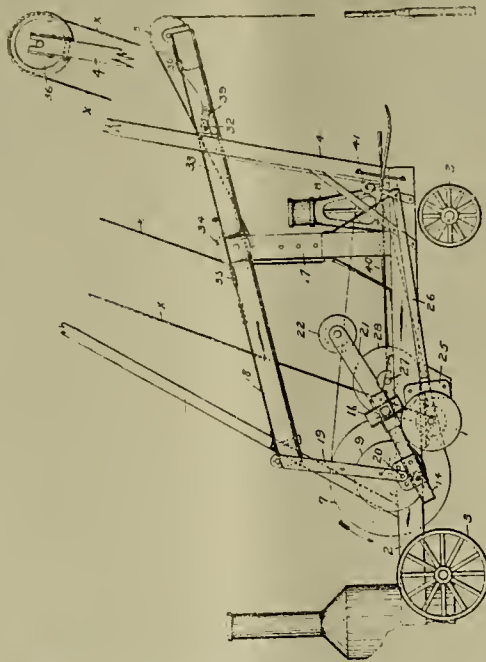
Combination with furnace and forehearth, of interposed separable cut-off valve arranged to open and close communication between two and means for removably securing one member of valve to furnace, other member of valve to forehearth and two members of valve together.

**MORTAR FOR STAMP MILLS.**—No. 779,521; M. P. Boss, San Francisco, Cal.



In mortar for stamp mills, having formed in it mortar bottom, and having columns at opposite ends of diameter of bottom, columns converging downwardly to flange of like internal slope which surrounds bottom, correspondingly tapered body shell detachably fitted within columns and flange, vertical keys engaging top of body shell, and cross keys slidably secured to columns and engaging lower ends of vertical keys, to detachably secure body shell to columns.

**WELL DRILLING MACHINE.**—No. 779,671; F. E. Simpkins, Allegheny, Pa.



Combination of shaft, arm mounted thereon and adapted interchangeably to turn with shaft or independently, spudding mechanism operatively connected to shaft, walking beam having detachable connection with arm, and means for oscillating arm.

**CONCENTRATOR TABLE.**—No. 780,031; F. E. Foster, Clifton, Ariz.

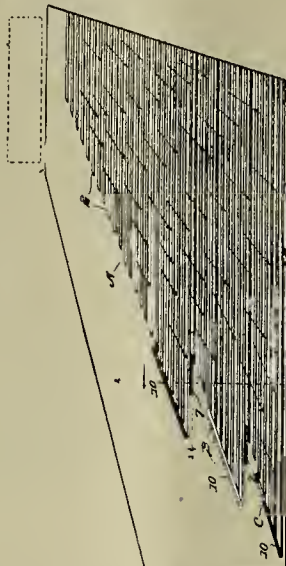
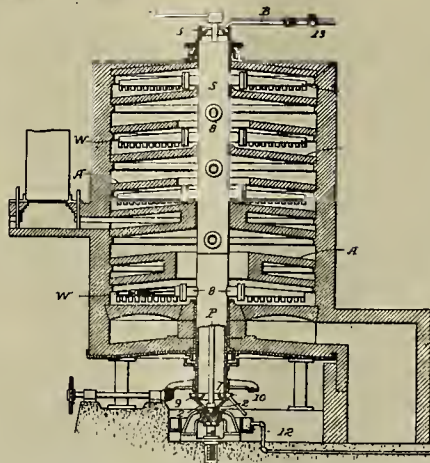


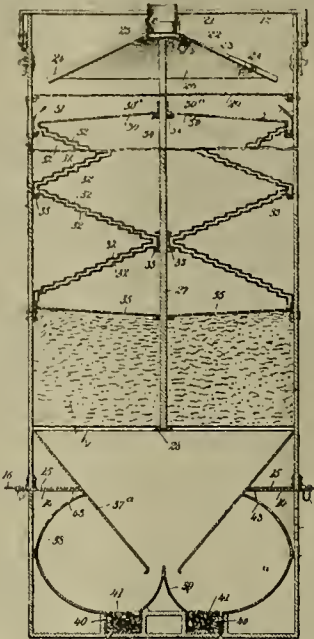
Table for reciprocatory concentrators having plurality of sets of riffles, upper edges of which are disposed in the same plane, each set being arranged to overlap next lower set, and openings being disposed within line of termination of riffles above them.

**ROASTING FURNACE.**—No. 780,115; A. R. Meyer, Kansas City, Mo.



Furnace having hearths and shaft or pipe with stirrer arms extending over hearths combined with water supply pipe at top of shaft, and conduits arranged to direct water from pipe downward along inner face of shaft.

**AMALGAMATOR.**—No. 780,109; B. A. Langridge, Boulder, Colo.



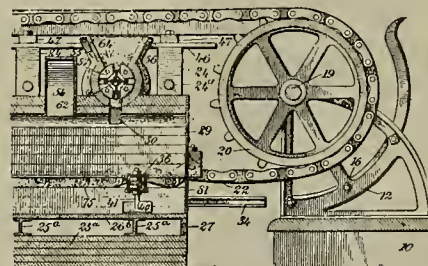
Amalgamator, comprising exterior casing having feed pipe entering upper portion, fan-shaped spreader plates located in upper portion of casing and each being fluted or bent from inner corners outward to outer edges, inner corners lying directly adjacent to inlet pipe and flutes or bends gradually increasing in width and depth toward discharge edges of spreader plates, two additional triangular plates located between spreader plates at each side of inlet pipe, all of plates forming low pyramid, and amalgamating devices below same.

**METHOD OF CLEANSING OIL WELLS.**—No. 780,279; W. E. Gardner, Pittsburg, Pa.



Method of cleansing oil wells which consists of first closing bore well at suitable point adjacent to upper end of oil-bearing strata and subjecting walls of bore thereof in oil-bearing strata to action of heated fluid.

**FURNACE FOR ROASTING ORES, ETC.**—No. 780,387; W. W. Tobey, Iola, Kans.



In kiln for roasting ores, combination of furnace proper, traveling members disposed adjacent thereto, rake bars connected with traveling members, shields secured to and encircling portions of rake bars that enter furnace, rake blades connected with rake bars and shields and adjustable vertically and angularly, and means for actuating traveling members.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

According to the twentieth annual report of the U. S. Geological Survey on the mineral resources of the United States, the mineral production for 1903 was \$1,419,721,569, as compared with \$1,260,509,738 in 1902, a gain of 12.63%. Iron and coal continue the most important mineral products. The value of the iron in 1903 was \$344,350,000; the value of the coal \$503,724,381. The gain in total value is due to the large increase in non-metallic productions. The metallic products showed a decrease of from \$642,258,584 in 1902 to \$624,318,008 in 1903, a loss of \$17,940,576, and the non-metallic products showed an increase from \$617,251,154 in 1902 to \$794,403,561 in 1903, a gain of \$177,152,407. To these products should be added estimated unspecified products, including building, molding and other sands, molybdenum and other mineral products, valued at \$1,000,000, making the total mineral production for 1903 \$1,419,721,569. The gold production was \$73,591,700 and silver 54,300,000 ounces of \$29,322,000 commercial value.

According to the United States Geological Survey, the mineral products of the United States for 1903 were as follows:

Metallic.	Quantity.	Value.
Pig iron, spot value.....	18,009,252 long tons.	\$ 344,350,000
Silver, coin value.....	54,300,000 troy ounces.	70,200,000
Gold, coin value.....	3,569,000 troy ounces.	73,591,700
Copper, value at New York City.....	698,044,517 pounds.	91,506,000
Lead, value at New York City.....	230,000 short tons.	23,500,000
Quicksilver, value at San Francisco.....	159,219 flasks.	16,717,995
Aluminum, value at Pittsburgh.....	7,500,000 pounds.	1,544,634
Antimony, value San Francisco, short tons.....	3,128	2,284,900
Nickel, value at Philadelphia.....	114,200 pounds.	548,433
Platinum, value (crude), San Fran., troy ozs.....	110	45,900
		\$2,080

Total value of metallic products..... \$ 634,318,008

### Non-Metallic (Spot Values).

Bituminous coal.....	282,749,348 short tons.	\$ 351,687,633
Pennsylvania anthracite.....	66,613,454 long tons.	152,036,448
Natural gas.....	35,815,360 barrels.	35,815,360
Petroleum.....	100,461,337 barrels.	94,694,050
Brick clay.....	15,000,000 barrels.	15,000,000
Cement.....	29,859,140 barrels.	31,131,341
Stone.....	67,990,483 short tons.	67,990,483
Corundum and emery.....	2,542 short tons.	61,102
Crystalline quartz.....	8,938 short tons.	70,008
Garnet for abrasive purposes.....	3,950 short tons.	132,500
Grindstones.....	721,446 short tons.	721,446
Infusorial earth and tripoli.....	9,219 short tons.	76,273
Millstones.....	52,552 short tons.	52,552
Oilstones, etc.....	366,857 short tons.	366,857
Arsenious oxide.....	611 short tons.	36,696
Borax, crude.....	34,430 short tons.	61,400
Bromine.....	568,500 pounds.	167,580
Fluorspar.....	42,523 short tons.	213,617
Gypsum.....	1,041,774 short tons.	3,792,942
Lithium.....	1,155 short tons.	23,425
Marls.....	34,211 short tons.	22,521
Phosphate rock.....	1,581,576 long tons.	5,319,284
Pyrite and sulphur.....	423,127 long tons.	1,109,818
Salt.....	18,908,089 barrels.	5,286,609
Barites, crude.....	50,397 short tons.	152,150
Cobalt oxide.....	120,000 pounds.	120,000
Mineral paints.....	62,122 short tons.	646,222
Zinc white.....	62,902 short tons.	4,801,718
Asbestos.....	887 short tons.	16,760
Asphaltum.....	101,255 short tons.	1,005,446
Bauxite.....	48,027 short tons.	171,306
Chromic iron ore.....	1,000 long tons.	61,102
Clay (all other than brick).....	1,650,835 short tons.	2,640,012
Feldspar.....	41,891 short tons.	256,733
Fibrous talc.....	60,230 short tons.	421,600
Flint.....	55,293 short tons.	156,947
Fuller's earth.....	30,693 short tons.	190,277
Glass sand.....	823,014 short tons.	855,828
Mica (crystalline).....	4,538,159 pounds.	2,255,554
Graphite (amorphous).....	16,591 short tons.	225,554
Limestone for iron flux.....	12,029,719 long tons.	5,423,732
Magnetite.....	3,774 short tons.	10,555
Manganese ore.....	2,825 long tons.	25,325
Mica sheet.....	90,100 pounds.	17,128
Mica, scrap.....	1,693 short tons.	41,990
Mineral waters.....	51,243,550 gallons sold.	9,041,078
Monazite.....	862,000 pounds.	64,690
Zircon.....	3,000 pounds.	570
Precious stones.....	321,400 short tons.	321,400
Pumice stone.....	885 short tons.	2,665
Talc and soapstone.....	26,671 short tons.	418,660
Uranium and vanadium.....	19 short tons.	5,625

Total value non-metallic mineral products..... \$ 794,403,561  
Total value of metallic products..... 634,318,008  
Est. value mineral products unspecified..... 1,000,000  
Grand total..... \$1,419,721,569

\*Not including \$6000 worth of platinum reported as contained in slimes from copper ore from the Ramblar mine, Wyoming.

†Included under pyrite in 1901, 1902 and 1903.

[Not including value of sixty short tons of cobalt ore produced in Idaho.]

### ALASKA.

The Portage Mountain M. Co., office 322 Union street, Seattle, Wash., has started work at the head of Duncan canal, near Wrangell. C. E. Jury is Alaska manager.

During May, June, July, August and September, 1904, C. W. Purington of Denver, Colo., and S. Paige journeyed through Alaska investigating for the United States Geological Survey the costs and methods of gold-placer mining in the Territory. For the purpose of making comparative observation, he also visited the Atlin district of British Columbia and the Klondike gold fields of the Yukon Territory. In studying the conditions which affect placer mining in our northern possessions, he was impressed with the inadequate means of communication between the different parts of the Territory. The gold mining which has been done in the interior of Alaska has been conducted in spite of difficulties of transportation which seem hardly credible. His conclusion is that highways must be constructed in Alaska if the Territory is to develop as it should. Owing to its varied topography, Alaska may be divided, from a highway standpoint, into three provinces—the south coast province, the central Yukon province and the Seward peninsula province. The portions of Alaska represented by the Alaska peninsula and neighboring islands and the Copper River basin, north of Prince William sound, were not especially considered by Mr. Purington, as those parts of the Territory appear to have no present need of expensive routes of communication. In general, it may be said, however, that the cost

of construction in the Alaska peninsula is the same as in the Seward peninsula, and the cost in the Copper River basin the same as in the central Yukon province. There is a great difference between the topography of the mountainous southeast coast and that of the rich placer districts in the flat interior, and the expense of road building in Alaska varies accordingly. Near Dawson, in the Yukon Territory of Canada, standard highways have been constructed by the Canadian Government at a cost of \$1500 to \$3300 a mile. The annual maintenance of such a road costs \$350 a mile. This locality offers the most instructive lesson in practical highway construction in the north, and affords a striking contrast in this respect to the adjacent American domain. The average cost of construction for sled or winter trail in this Territory is from \$250 to \$350 a mile. These trails can be maintained for about \$25 a year. Previous to the construction of the wagon roads, transportation charges per 1000 pounds from Dawson to Grand Forks, a distance of 12 miles, amounted to \$7. The same amount of merchandise is now transported the same distance for \$1. The improved conditions thus mean a direct benefit to the miner of at least 600% on all supplies and machinery freighted by wagons over first-class roads. It is estimated that standard highways, similar to those in the Canadian Yukon, could be constructed in the central Yukon province in the Tanana, Birch Creek and Koyukuk districts for from \$1200 to \$3000 a mile. Such roads could be maintained on a yearly allowance of \$350 a mile. Sled or winter trails might be constructed in the same district for \$300 a mile. A. H. Brooks has suggested the following routes for Government roads in the central Yukon province of Alaska: 1. A road from Eagle to the Tanana, the Chistochina, and to Valdez, on the coast, a distance of 400 miles. 2. A road to extend from Circle, on the Yukon, through the Birch Creek and Fairbanks districts to the Tanana, a distance of 150 miles. 3. Rampart, on the Yukon, to be connected with the mouth of Baker creek, on the Tanana, by a road which would open up the Minook and Baker districts, a distance of less than 50 miles. 4. About 100 miles of road to be built in the Koyukuk region, to connect the gold-bearing creeks with the head of steamboat navigation on Koyukuk river. It is believed that these roads would form a system of main arteries by which most of the placer fields could easily be reached, and that the production of the mines would thereby be so much increased as to fully justify the expense. In the central and western portions of Seward peninsula, that is in the Nome, Solomon, Council, Topkok, Kugrook, Teller and York districts, any projects of installation of roads must take into account the entire absence of native timber. The cost of building the narrow-gauge railways in use there was \$6000 a mile, exclusive of rolling stock. The cost of wagon roads of the Dawson type would rarely fall below \$4000 a mile. Considering the comparative cheapness with which railway material can be hauled at various points on Seward peninsula, it is likely that short lines of railway will continue to be built by private enterprise to supply the several inland mining communities. In this part of the Territory the Federal Government should aid in the construction of tramways rather than railroads. Mr. Purington makes the suggestion that narrow-gauge pole tramways laid over the tundra might in some cases be used in parts of Seward peninsula for long hauls. On account of the mountainous character of the south coast province, the construction of wagon roads there is so expensive that it is not likely that they will be built except as heretofore, by private enterprise, to accommodate individual mining properties. The winters are extremely severe in the higher mountains. In the construction of the White Pass & Yukon Railway, 110½ miles in length, 1500 men were employed for a period of twenty-six months. The average cost of removing snow from the tracks in the course of a season is \$75,000.

### ARIZONA.

The estimated output for 1904 of most prominent copper properties in Arizona is:

	Pounds.
Arizona Copper Co.....	28,000,000
Calumet and Arizona.....	21,000,000
Copper Queen.....	58,000,000
Detroit Copper.....	18,000,000
Old Dominion.....	16,000,000
Shannon Copper.....	12,000,000
Troy Manhattan.....	500,000
United Verde.....	34,000,000
Small companies, custom smelters and products of ores shipped out of the territory in excess of importations.....	10,000,000
Total.....	200,500,000

### Cochise County.

(Special Correspondence).—The flue dust chambers of the Bisbee smelter are being demolished and the metal in the smoke and dust deposits are being recovered. Scaffolding has been erected between the walls and the work of getting the brick partitions down is proceeding with safety as well as speed. As the debris is cleared away the amount of flue dust continues to increase and several cars of this valuable material will soon be ready for shipment to the smelter for treatment. Assays of the dust show copper values ranging from 12% to 36%, with gold and silver. Assays for gold have shown values of \$20 to the ton. The Huachuca M. Co., near Bisbee, is about to build a 75-ton plant. Smith, Vanderman, Holtz & Cobb have bonded their interest in eight claims, near Paradise, to W. G. Rice of Houghton, Mich., for \$7000 for two years, Rice to begin work within sixty days. Bisbee, Jan. 24.

### Graham County.

(Special Correspondence).—The Tri-Bullion Smelting & Development Co. of Chicago, who are operating the Starlight group in Kelly gulch, 9 miles south of San Carlos, have shipped five cars of ore netting \$1000 per car, from the Ryan shaft. The tunnel on the Starlight mine is in 1400 feet. This tunnel furnishes an abundant supply of water for reduction purposes. The company will build in Kelly gulch a concentrating plant of fifty tons daily capacity by which the gold, silver and lead values will be saved. As the copper in the ore is carbonates and oxides the company will store the tailings and later erect a leaching plant to extract the cop-

per values. H. Paschal is president and general manager; J. P. Hendrick, secretary and treasurer, and W. J. Nicholson, superintendent. San Carlos, Jan. 23.

### Gila County.

The Arizona Commercial Co., with properties adjoining the Old Dominion in Globe, has been reorganized as the Arizona Commercial Copper Co. They will purchase the Matamora group, adjoining the Arizona Commercial, and will build a 1½-mile narrow gauge railroad to connect with the Gila Valley, Globe & Northern and the Old Dominion railroads. A smelter site has been obtained. Superintendent W. S. Sultan has started work and will increase the force. N. S. Amster of Boston is consulting engineer.

### Maricopa County.

(Special Correspondence).—The Black Canyon M. Co. has sold its property in the Black Canyon mining district to the Gy-Zo-Chemical Co. for \$50,000, and the new company, capitalized at \$1,000,000, has already expended \$30,000 in developments and improvements on this property which consists of six geysers, the source of the remarkable product that is, throughout the West, being introduced to replace antiplogistine. Maricopa county has built a wagon road to the property, 50 miles from Phoenix. The president is W. Banning and the treasurer, H. Banning of Los Angeles, Cal. M. N. Esky, the secretary, is manager of the Pacific hospital in Los Angeles and was the original manufacturer of antiplogistine.

Phoenix, Jan. 23.

### Pinal County.

(Special Correspondence).—The Troy-Manhattan Co., at the Buckeye shaft at Troy, is putting in two large boilers fitted for burning oil. The oil will be hauled 7 miles from Kelvin, the nearest point on the Phoenix & Eastern Railroad. C. H. Cutting is general manager and T. Kavanaugh, superintendent. Kelvin, Jan. 23.

### Yavapai County.

(Special Correspondence).—The mill of the Congress mine of the Con. G. M. Co., at Congress, has been closed down until further development work can be carried on. The company is working a cyanide plant to full capacity to clear up all the values in the old product, and is working in shaft No. 5 night and day, being down 1875 feet, going at the rate of 27 feet per week. In this shaft 4000 gallons of water are handled each day. The water is pumped to the surface and there turned to good account at the large cyanide tanks. The company has an unlimited amount of low-grade ore, which runs about \$4 to the ton, but under present conditions and facilities it does not pay to work this.

Congress, Jan. 24.

### CALIFORNIA.

PRODUCTION OF GOLD, SILVER AND COPPER IN CALIFORNIA IN 1903, BY COUNTIES.

COUNTIES.	Placer	Gold.	Placer	Silver.*	Copper	Total
		Quant.		Deep Mine		
Alpine.....		2,796		52		\$ 2,778
Amador.....	\$ 15,151	1,360,357	4	5,392	15,000	1,391,554
Butte.....	1,475,307	66,614	254	7,467		1,544,857
Calaveras.....	95,450	1,803,055	10	73,019	2,448,182	2,294,346
Del Norte.....	10,883					10,883
El Dorado.....	75,451	288,500				364,516
Fresno.....	4,940	17,809				22,800
Humboldt.....	41,689					42,051
Inyo.....		101,10		23,850	18,850	134,284
Kern.....	6,750	1,041,511		117,650	4,300	1,166,479
Lassen.....		93,590		1,307		94,900
Los Angeles.....	2,200	3,968				6,165
Madera.....		66,048		14	36,000	70,742
Mariposa.....	1,725	565,303		3,850	30,615	575,677
Mono.....	2,900	376,658		23,710	9,810	408,065
Monterey.....	9,720	1,669		15		11,434
Nevada.....	286,885	2,062,148	21	5,575		2,354,629
Orange.....	150					150
Placer.....	568,624	123,060	76	70	4,000	693,344
Plumas.....	137,025	137,154		355	1,000	274,781
Riverside.....	300	12,653				12,953
Sacramento.....	330,064		171			331,135
San Bernardino.....	8,880	378,204		13,421	60,400	408,481
San Diego.....	18,500	359,656		1,462		379,618
San Luis.....						
Shasta.....	1,084					1,084
Siskiyou.....	15,961	712,336		214,028	16,453,409	3,113,834
Siskiyou.....	174,855	133,025		271	300	308,212
Siskiyou.....	304,856	332,754	38	940		638,597
Stanislaus.....					122,000	15,890
Trinity.....	322,839	290,172	41	184		614,336
Tulare.....		7,215				7,215
Tuolumne.....	13,242	1,898,308		8,361		1,919,921
Ventura.....		87				87
Yuba.....	125,386	2,098	41			128,122
Totals.....	\$1,052,761	\$12,247,802	\$661	\$497,751	19,213,696	\$19,340,446
Grand totals.....		\$16,300,653		\$498,412		\$19,340,446

\* Commercial value.

Total value of copper was \$2,533,355. Butte county produced \$210 in platinum, Humboldt \$362, Placer \$280, Trinity \$100; total \$952. Of the total of 166,946 pounds of lead, valued at \$7074, Inyo county produced 161,185 pounds, Mono 4720 pounds, San Bernardino 802 pounds and Tuolumne 236 pounds. These are included in the totals.

Regarding the gold and silver production of California for 1903, C. G. Yale in a United States report says returns received by the United States Geological Survey show California to have produced in 1903 gold to the value of \$16,300,653; silver (commercial value), \$498,412; copper, \$2,533,355; lead, \$7074; platinum, \$952; total, \$19,340,446, showing a decrease in gold product of \$491,447 and an increase in silver product of \$20,988, making a total decrease of \$470,459 as compared with 1902. This loss in annual product may be attributed chiefly to labor strikes at various large producing gold mines and copper mines producing gold, which caused the enforced idleness of such mines for periods of from one to three months. These troubles were not confined to any one section, but occurred in the mother lode counties, where many of the largest producers are situated, in Kern county, to the south of San Francisco, and in Shasta county, to the north. The mines ultimately resumed operations, though several have had to employ non-union men and are not working the same force as for-



merly, work being thus more or less hampered. The most noteworthy feature in connection with the gold production in California is the marked and rapid advance of the gold dredging industry. The total returns from the dredgers operated in 1903 were \$1,475,749. This result was obtained from twenty-five machines operating at Oroville, Butte county, three in Sacramento county, one in Siskiyou, one in Trinity and one in Yuba. Of the total for 1903, the sum of \$1,329,998 came from Butte county, the center of the dredging industry. The number of dredgers in the first part of 1904 at Oroville was twenty-seven, and in the summer of that year two of the largest dredgers in the State were installed between Marysville and Smartsville, on the Yuba river. Others have been built in Calaveras, Shasta and Trinity counties, and more are being constructed at different points. Ground suitable for dredging purposes is being prospected in many counties of the State, and is in great demand at prices ranging from \$500 to \$3000 per acre, according to prospective value. For the first time in the history of the State the output of the dredgers has exceeded that of the hydraulic or the drift mines. This fact alone shows the rapid advance of this branch of gold mining. The hydraulic mines produced in 1903 the sum of \$872,812, and the drift mines \$905,679. The dredger output exceeded each of these and came within about \$300,000 of equaling the product of hydraulic and drift mines combined. The principal section of hydraulic mining has changed of late years, and is now in Trinity and Siskiyou counties, though Nevada county shows a yield from this source of \$124,439. Trinity county produced \$233,093 and Siskiyou \$173,337 from hydraulic mines. Placer county leads all others in drift mining, its output having been \$331,002 from this source. Sacramento county comes next with \$213,867. Sierra, Butte and Plumas counties have been eclipsed in this respect by Sacramento, where little or no drift mining was carried on until recent years. The operations in the Blue Ravine section, above Folsom, have brought about this result. The largest drift mining operations, however, are still carried on in Placer county. The quartz mines, however, continue to be the main source of the California gold supply, the sum of \$12,247,892 out of \$16,300,653 having come from quartz mines in 1903. This shows that fully 75% of the California gold comes from the quartz properties, the other 25% being from hydraulic, drift and surface placer mines. The largest amount of quartz came in 1903 from Nevada county, followed in relative rank by the counties of Tuolumne, Calaveras, Amador and Kern, all of which show a yield in excess of \$1,000,000, Nevada county alone producing over \$2,000,000.

#### Amador County.

(Special Correspondence).—The drift being extended southeasterly from the Lincoln shaft toward the Wildman workings is in a fissure in which the gouge and stringers of quartz and calcite, characteristic of the proximity of an ore body in this region, are making their appearance. The material being passed through is showing low-grade values and are stated to be improving. This level is nearly 600 feet below the lowest level of the Wildman. In the latter mine on the lowest level, the 1400, drifting is progressing both north and south and good ore is being developed in both directions and the mills will soon be running to their full capacity. If these new developments continue to show improvement, it is the intention of the company to continue the Emerson vertical shaft, now down 650 feet, to 4000 feet or more and to equip the property with steel head frame, heavy hoisting machinery and larger milling facilities. The Emerson shaft is one of the best constructed and equipped shafts in the West, and through it a large tonnage of ore can be handled when connection has been made with the levels below the 1200 of the Wildman. The property includes the Wildman, Hector (Mahoney) and Lincoln claims, beside a large area of property lying on the hanging wall side and held originally under agricultural patent, so the extralateral right is secured. In recent years the career of this property has been handicapped by being obliged to work through small inclined shafts, sunk in the fissure, and the heavy, swelling ground has been a source of large and constant expense in keeping the ground open. With the extensive improvements contemplated it will make it possible to work a grade of ore considerably lower than at any time in the past history of the mine, excepting possibly the period during which open-cut work was the principal method of mining the ore. Fortunately the mine makes comparatively little water, although the amount of ground open is very large—many thousands of feet of shaft, level and stope. The ventilation will be vastly improved when connection is made between the main workings and the drift from the Lincoln shaft. John Ross, Jr., is manager, at Sutter Creek.

Sutter Creek, Jan. 23.

(Special Correspondence).—It has been decided that the railroad from Ione to the vicinity of Jackson and Sutter Creek shall be continued to the timber belt of Amador county, and shall be a standard gauge steam road, instead of electric. It will aid greatly in the development of this county, as heretofore a 12 to 13-mile up-hill haul has been necessary to bring in all mining supplies.

Sutter Creek, Jan. 25.

The twenty stamps from the Baliol mine have been put up at the South Eureka mine at Sutter Creek by B. B. Haven, superintendent, giving forty stamps in all.

#### Calaveras County.

The Voinich M. Co. has bought the 40-stamp mill of the Amador Queen mine, near Middle Bar, in Amador county, and will put it up at the Voinich mine at Bear mountain, 5 miles west of Angels Camp.

#### Fresno County.

The Copper King mine at Letcher, on Dog creek, 27 miles from Fresno, is being reopened by Chas. Leavitt, after being closed for two years pending litigation. The mine was opened on a schistose vein 100 feet wide, all mineralized, but with a pay streak 2 feet to 20 feet carrying carbonate, oxide and sulphide ores. Mine was operated by electric power generated from steam made by crude oil. The main shaft is 450 feet deep.

#### Inyo County.

The mill of the Southern Belle M. Co., near Laws, has been completed and given a trial run by Superintendent A. E. Vandercrook.

#### Kern County.

The electric plant of the Kern River Co. at Kernville has been completed. In anticipation of diverting the river into the power canal, Huntington and others of Los Angeles located placer claims along the river, which will now be worked. J. Wingfield found good dirt near Isabella.

#### Los Angeles County.

(Special Correspondence).—The Lowell & California M. Co. are working the Big Horn mine at the headwaters of the San Gabriel river, west of Palmdale. This is a low-grade proposition with a vein 50 feet wide which the superintendent, F. C. Fenner, claims to be working for less than \$2 per ton, using a modification of the caving method in mining. The fact that the vein lies at the low angle of 23° from the horizontal renders the cheap handling of this mine unusually difficult where so little timber is employed. The vein is developed by several tunnels. The company owns 500 acres of mineral land in the group with abundance of water for milling. The mill of ten stamps is being enlarged.

Los Angeles, Jan. 21.

The Reward M. Co. of New York is putting up a 75-stamp mill on its property between Lang and Rusk, in Agua Dulce canyon, where there is a large body of conglomerate ore.—H. S. Farnsworth of Los Angeles is drilling for water near Newhall, preparatory to working his placer ground.

#### Nevada County.

G. W. Root and H. Reher have struck the grave channel in the Auriferous on Randolph flat, near Nevada City, after running a 600-foot tunnel and a 45-foot up-raise.—At the Spanish Ridge mine, 6 miles above Washington, E. B. Miller has put in ten more stamps, giving twenty in all.

At the Idaho-Maryland the shaft has been pumped out below the 375-foot level and new timbers put in.—C. C. Weisenburger is putting in a new washing plant at the Banner gravel mine, near Nevada City.—It is reported that the Pine Hill mine, near Auburn, may be reopened by J. A. Robles.—The Yuba mine, at Maybert, is stoping ore from the upper levels.

#### Placer County.

At the Paragon drift mine at Bath, W. Rea is operating everything by water power at a great saving.

#### San Diego County.

Many new gem discoveries were made in southern California during 1904. They included blue and white topaz, weighing more than a pound apiece, which as crystals equal those of Siberia; beryls from 3 to 6 inches long and 1 or more inches in diameter, varying in color from pale green to a deep sea green tint; crystals of rose-colored heryl (a very rare variety), found at Mesa Grande and Pala; epidote in crystals only 1 inch long and 1/2 inch in diameter, but transparent; red, green and yellow tourmalines, found in abundance at Mesa Grande and Pala.

#### Trinity County.

The Lappin G. M. Co., working the Lappin mine at Deadwood, has put in a 5-stamp mill and will run a lower tunnel 900 feet to open up ore and drain the mine.

### COLORADO.

(Special Correspondence).—Suits aggregating \$250,000 have been brought in the district court against fifty of the prominent operators and citizens of the Cripple Creek district by the Western Federation of Miners. These suits are the outcome of the partial wrecking of the union stores in the district on June 6 and August 20, 1904. A deed for the union hall in Cripple Creek was placed on file a few days ago transferring the property of the Western Federation to the president of the Federation. This deed was made out several months ago, but was only recently filed for record. The deed recites that the union are unable to hold meetings in their hall in peace on account of the conditions existing in the district. The charter of the union was also surrendered.

Denver, Jan. 23.

#### Boulder County.

The Blackbird tunnel, at Sunshine, has been driven 315 feet by P. J. Collins.

#### Clear Creek County.

Estimates are being called for by the Yankee Con. M., M. & T. Co., at Yankee, for the equipment of the Lombard shaft with a 125 H. P. boiler, a hoisting plant strong enough to hoist two and a half tons at a rate of 600 feet per minute, an air compressor, etc. As soon as the next level is reached and driven, the Lombard mill will be enlarged to double its capacity. An aerial tramway will be built to connect the mines with the mill. H. I. Seeman is president and manager.

#### Gilpin County.

The Park tunnel of the Black Hills & Denver M. Co. in Boulder park is being retimbered and the company may put in an air compressor.—F. Augustus of Rollinsville has interested Iowa people in erecting a 10-stamp custom and concentrating plant near Rollinsville.—The sampling works of the Independent S. & R. Co. at Black Hawk, D. Allen manager, will buy a large rock crusher and rolls.—At the Lynne shaft of the Eldorado M. Co. at Russell Gulch levels are being driven at the 110-foot level. Sinking will be resumed from the 115-foot level. S. T. Harris is manager.—Manager Kirk of the Caseltine mine, near Central City, is retimbering the shaft and putting in machinery. The shaft will be sunk 300 feet.

F. Augustus, manager of the Mountain Monarch M. Co., operating in Gambell gulch, near Rollinsville, has raised capital in Iowa for a 10-stamp and concentrating custom mill to be erected on South Boulder creek.—J. H. White of Colorado Springs is unwatering the Victoria group at Gilpin, for Colorado Springs and Eastern parties who wish to examine the property. The main shaft is down 150 feet, with about 500 feet of level

work performed and the upper workings have produced considerable ores.—A 20-foot vein of medium-grade ore, which will make a first-class milling proposition, values running up to over \$15 per ton, has been opened up on the Hamilton group. It is the intention of the lessees to build a mill in the spring.—The Gold Dirt M. Co. will let a contract for a new 100-ton mill in Gambell gulch.

#### Gunnison County.

The Cripple Creek Gold Temple M. Co., which owns the Rocky Point and Lookout claims, on Shoop Mt., near Crystal, has given a five years' lease and bond for \$1,000,000 to J. Hirschfeld & Co. of Philadelphia, Pa., who intend to erect a mill of 150 tons capacity and build a 3-mile tramway from mine to the mill. The tunnel has been driven 1000 feet and the shaft sunk 700 feet.

#### Ouray County.

Work has been resumed on the Yale-Brown tunnel, near Red mountain, with C. M. Collins as superintendent. The property consists of thirty-four claims. The work consists of driving a tunnel, with the ultimate intention of extending it several thousand feet and developing Mineral and Porphyry basins. The tunnel is in about 100 feet.

At the San Pedro tunnel, near Ouray, being run by Terry & Trench of New York, the cost of which will probably reach \$125,000, the contractors are installing heavy machinery.—The excavation for the additional ten stamps at the Treasury tunnel is completed and the foundation ready to put in. The machinery will likely be delayed some time on account of the unsettled condition of the weather. The machinery already installed is running satisfactorily and the work on the big tunnel is going ahead.

#### San Juan County.

The Missouri Fred G. M. & M. Co., working at Middle mountain, 2 1/2 miles from Boulder, has closed down for the winter, but will resume work in the spring, making extensive improvements. The president is W. Ellsworth; general manager and secretary, F. J. Fraley; treasurer, C. B. Henney; superintendent, J. J. Rico, at Ignacio.

The annual meeting of the Mines Securities Corporation, held in New York, elected T. E. Leeds president, T. J. Hurley managing director, F. E. Pinto, Jr. vice-president, and T. J. Tilney secretary and treasurer. Mill No. 1 on corporation's Ruby Basin mines at Silverton, Colo., was started commercially on Dec. 1. Negotiations are in progress to erect on the Natalie mine next spring mill No. 2 of four times the capacity of the present plant.

#### Teller County.

The Isabella M. Co. at Cripple Creek has decided to sink the shaft on the Empire State an additional 500 feet to 1350 feet.—A sinker pump is being installed on the Nugget claim, owned by the Legal M. Co., in order to handle the increased flow of water. The shaft has reached a depth of 200 feet.—A contract has been let by the company leasing on the Mary Nevins to sink the shaft an additional 200 feet, which will send it to a depth of 325 feet.

### IDAHO.

#### Blaine County.

The Black Pearl M. Co. at Pearl have sunk a double-compartment shaft 415 feet and have run 1700 feet of tunnel. An air compressor and electric motor are being put in to operate the hoist, pump and drills. The shaft is to be sunk to a depth of 1000 feet. The company have bought the Lucky Ridge group and will sink a 390-foot shaft before drifting is started. R. B. Anderson is manager. E. E. Rodgers of Chicago is president.

#### Elmore County.

Spear's American Exchange is working the Basil mine, 20 miles north of Pine, with six men in the tunnel, which is in 140 feet. M. H. Jacobs is consulting engineer.

#### Idaho County.

The Sunnyside mill, in Thunder Mountain district, has closed after a trial run on 180 tons of low-grade ore. The superintendent, E. L. Ahcott, says the saving was satisfactory. The ore was crushed to 20-mesh. The tram, which has a cable 7345 feet long, made trouble at first through the method of attaching the buckets, and several of them broke loose with disastrous results. Modified grips to connect the buckets to the cable are being put in. The rock crusher at the mill, driven by power afforded by the descending ore on the tram, proved too small for handling the large pieces of ore coming from the stopes, and it has been decided to take in another crusher. Development in the upper works has stopped. The Burr tunnel is being driven to develop the ore blanket deeper. It will catch the lode by a raise of 175 feet. The tunnel is in 1650 feet and should be finished with 200 feet more driving by June 1.

#### Kootenai County.

It is reported that a stamp mill and cyanide plant will be put on the Farmer Jones mine, 8 miles from Priest river.

#### Nez Perces County.

The Hillside M. & M. Co. at Lewiston elected J. W. Killinger president and general manager, C. A. Varney secretary and E. F. Gordon superintendent. The company will build a flume, put in a motor and a sawmill in the main tunnel at Big creek.

#### Shoshone County.

The Oom Paul M. Co. will sink 300 feet on the vein at its property on French gulch, near Burke, and will put in an electric hoist and pump to be run with power from Spokane.—The Morning M. Co., at Mullan, has driven the working and drainage tunnel over 6000 feet.

### MONTANA.

Regarding mineral production in 1903, the United States reports credit Montana with producing 272,555,854 pounds of copper. The production was hampered by the continuance of legislation in Butte, which produces the hulk of the product. The Amalgamated Copper Co.



controls the Anaconda, Colorado, Parrott, Butte & Boston, Boston & Montana, and Washoe properties, the ores of the Anaconda, Colorado and Parrott companies being reduced at the Washoe smelter. The Butte Reduction Works treat the ores from the mines owned by W. A. Clark, and the United Copper Co. smelts the ores of the Minnie Healey, Corra-Rock Island and Rarus mines. The Pittsburg & Montana M. Co. has been developing its mines and has erected a smelting plant. The Speculator mine ships its ores to the smelters of the district. None of the companies of the district publish annual reports, so that statistics relating to the yield of the ores, to costs, or to financial results are not available. Statements are annually filed with the tax commissioner of Montana, which cover a fiscal year, but since they do not embrace figures as to the output of copper, silver and gold, they permit only of approximations as to the capacity of the district. Copper is also found in the counties of Beaverhead, Cascade, Deer Lodge, Granite, Jefferson, Madison, Meagher, Lewis and Clark, Park, Silver Bow and Teton, the ores being mainly sulphides, usually associated with diorites intrusive in Cambrian quartzites.

#### Granite County.

The Gold Reef M. Co., near Phillipsburg, has been closed by Superintendent J. H. Price until spring.

#### Lewis and Clark County.

The Montana Standard M. Co., near Marysville, opening up the veins on the east end of Cruse hill, expects to run a 3000-foot tunnel to develop a vein recently struck.

The Whitlatch M. Co., operating the Whitlatch-Union mines at Unionville, 4 miles from Helena, is sinking the main double-compartment shaft and may erect a milling plant. F. L. Sizer of Helena is manager.

#### Silver Bow County.

The Montana Zinc Co. is building a mill at Walkerville to extract the zinc from the ore from the Alice mine. It has purchased the Emma mine for \$100,000 to be worked in connection with the Alice, and will repair the shaft, put in new machinery and work it for zinc. These mines were formerly worked for gold and silver. The process of zinc extraction is very largely the invention of C. B. Wisner of New York, the president of the company.—The Reins Copper Co. is shipping ore from the Combination mine at Meaderville in the Summit Valley district. The Jeanesville pump at the new station at the 800-foot level is capable of pumping 700 gallons per minute to the surface. Ore bins have been constructed near the shaft, and are heated with steam to prevent the ore freezing. The ore is treated in the Washoe smelter at Anaconda. E. J. Trerise is superintendent.

#### Ravalli County.

At the Verdi mine, 16 miles northeast of Hamilton, good copper ore has been found by O. E. Smith. J. C. Carter is superintendent and will develop the property extensively.

### NEVADA.

#### Esmeralda County.

The Western Ore Purchasing Co. of Reno will build a 700-ton sampling works at Goldfield.

#### Humboldt County.

The Sheha G. & S. M. Co. say that they have 4000 feet of track in their workings at Unionville. The new tunnel is in 1100 feet. They have built a dam to increase the water supply, and put in a 5000-foot pipe line, air compressor and a drill.

#### Lincoln County.

C. G. Austin of Los Angeles, Cal., has bonded the Hare & Hunsaker property at Eldorado, and will drive a 650-foot crosscut tunnel.—The Duplex M. & M. Co. at Searchlight, F. P. Swindler manager, will sink a 500-foot shaft and put in a 40 H. P. hoist.—The new 10-stamp mill of the Quartette has been started while the old batteries are being repaired.

#### Nye County.

The Tonopah Sun says that freighters between Tonopah and Goldfield will charge 1 cent a pound for all general merchandise and 2 cents a pound on household goods. The advance is from \$15 to \$20 a ton on the first kind of goods and an increase of from \$15 to \$25 on those of the second class. The reason for making the advance is not claimed to be arbitrary on the part of the freighters. They have, within the past few weeks, been compelled to meet advances which would so reduce their profit that they would be able to make but a bare existence. The railroad company has raised the freight on hay from Sodaville \$10 a ton, and has issued an order that hereafter every two cars of hay will have to be accompanied by a man. This is for the purpose of keeping the hay from catching fire. When the trip is made from Sodaville without stopping, the wages of a watchman are \$4 per diem. Sometimes, however, the cars are sidetracked between the two towns, and the sum paid to the man in the employ of the shipper takes whatever profit there may be in the hay. One company asserts that it has two cars of hay that are sidetracked on the desert, and that the cars have been standing on the siding for two weeks. The producers have doubled the price of horse feed within the last thirty days.—The Manhattan-Tonopah M. Co. of New Jersey is developing the five claims, and will install a first-class hoisting plant.

The Little Frankie G. M. & M. Co. has been formed at Ogden to work the Little Frankie, Irene, Gold Standard and the United Gold by J. F. Smith, president. E. A. Smith, secretary and treasurer, and W. Copernall, managing director.

#### White Pine County.

The White Pine Copper Co. is experimenting with the ores of the Ruth, Last Hope and Columbia at Ely. They will put in a mill and concentrating plant and perhaps reduction furnaces. The copper occurs as sulphide in a kaolinized mass carrying gold. M. L. Requa, 100 Front St., San Francisco, Cal., is interested.

### OREGON.

#### Grant County.

G. Walker is manager of the Dredge Co., working the placer ground on John Day river and Canyon creek, above the junction.

F. McDonald of Prairie City has sold one-half of the New Year's Gift to T. H. Murphy of Greenhorn.—The new mill of the Dixie mine at Prairie City has been temporarily shut down by Z. Houser because of cold weather.—The Crane Flat placers, near Granite, are to be worked by the Western M. & D. Co. The pond to float the dredger has been dug and the machinery has been delivered, but will not be set up till spring. A. Burch of Seattle, Wash., has charge.

#### Jackson County.

The Siskiyou M. & D. Co. has been formed at Ashland to develop and operate placer and quartz mines in placer county, Oregon, and Siskiyou county, Cal., by T. J. Nolton, Wm. Hulen, A. H. Findley, J. W. Potter.

#### Wallowa County.

The Tenderfoot G. M. Co. will put up a 20-stamp mill at the mines on the upper Imnaha river, 62 miles from Elgin; also an aerial tramway from mine to mill. Dr. Tripp of Sioux Falls, S. D., is president.

### SOUTH DAKOTA.

T. Gregory, State Mine Inspector of South Dakota, in his annual report states that there are 3500 wage earners on the payroll of South Dakota mining companies, employed as miners, helpers and timbering crews, mill men and mechanics. The average daily pay of the miner is \$3.50, helpers \$3 and shovelers and mill hands \$2.50. The compensation of skilled mechanics about the mines is considerably higher. Generally the length of the day is ten hours where mining is regularly conducted, although in the sinking of shafts and the running of other new work, where conditions are trying and where the most rapid headway possible is desired, three shifts of eight hours each are sometimes employed. The bodily welfare of employees is given commendable attention by the management of every important mine in the State; all reasonable pains are taken to guard against accidents that might produce loss of life and injury; rooms are in most instances provided where employees going on or off work may change raiment and bathe in comfort during severe weather, and, where necessary to mining companies employing any considerable number of men, boarding and lodging houses have been built by the companies at points convenient to work. Rules of sanitation are carefully observed, and adequate ventilation is afforded in the remote recesses of the mines to keep the atmosphere pure when men are working, while in some of the mills, where dust would otherwise be objectionable if not a dangerous element, dust collectors used on fans have been introduced to keep the air free of the floating particles.

The following shows the daily tonnage of the various gold reduction plants in the State which have been in use all or part of the year: Alexander Maitland, 120; Clover Leaf, 240; Dakota, 120; Golden Reward (cyanide plant), 200; Hidden Fortune, 120; Homestake, 4000; Horseshoe, 300; Imperial, 125; Lundberg, Dorr & Wilson, 100; Spearfish, 250; Wasp No. 2, 125; Black Eagle, 20; Clara Belle, 20; Cochran, 20; Columbus Con., 75; Extreme, 40; Golden Crest, 40; Rossiter, 50.

The following summary from Black Hills mines shows the field operations of the various companies. Alder Creek G. M. Co. owns 65 acres on Yellow creek; suspended operations a year ago owing to internal complications which are now being adjusted, with reasonable prospects of a resumption at the 65-ton cyanide mill. Branch Mint M. Co. is building mill of 120 stamps and 3 miles of narrow gauge railroad in Bear Butte district. Clara Belle M. Co. has introduced new machinery and resumed work late this year in its Tremaine mill. Clover Leaf G. M. Co. is operating 60 stamps and adding \$200,000 worth of new machinery. The shaft is being deepened from the 700 to 1,000-foot level, and the developments of the year have been very favorable. Ventilation is good, produced by connection with open cut and circulating water. Cochran mine, owned by Jas. Cochran, operated a small mill part of the summer. Columbus Con. M. Co. suspended mill early in the year, and is developing with crosscut drifts at 500 feet in depth. Dakota M. & M. Co. mine and mill running full capacity since beginning of the year. New shaft started and equipped with modern machinery, intended to explore lower ore horizon. Deadwood-Standard G. M. Co.: Extensive prospecting is under way with drills in quest of higher grade ore; meanwhile the mill is suspended. Extreme G. M. Co. built a 10-stamp mill near Custer early in the year and has operated it several months. Gilt Edge Maid M. Co.: A new mill, to be run by electric power, has been finished and is ready for the initial run. Golden Reward M. Co. operating only its cyanide plant at Deadwood, as the smelter at Deadwood has not resumed since it was closed in March, 1903. Ore is taken altogether from the northerly mines of the company's group. Golden Crest M. Co. has devoted the last 10 months to development of the property. Hidden Fortune G. M. Co.: New mill has been running greater part of the year, with gradual increasing capacity. The ore is taken from the flat, siliceous formation and from the tunnel in the vertical. Homestake M. Co. has added 100 stamps to the Amicus mill during the period, giving the company a total of 1,000 stamps, and the monthly output of the mines greater than ever before. The costly improvements that have been under way about the property for over seven years have been practically completed, the producing ability of the mine is greatly enhanced, valuable and permanent improvements are the result, and the company is fortified for an indefinite period of successful operation. The deepest shafts are 1,250 feet deep, from the bottom of which development is under way. At Horseshoe M. Co. nearly all the stamps in the 120-stamp mill are in service. Important improvements have been added to the mining and milling facilities. Imperial G. M. and M. Co. has acquired the McGovern group and Greenough group. Cyanide mill at Deadwood is in continuous operation. Lexington Hill G. M. Co. is driving a tunnel to connect the mine and

mill directly. Lundberg, Dorr & Wilson are owners of the Buxton and Big Bonanza mines and a modern cyanide plant, which has been in continuous commission since early in the year. The plant is driven electrically. Ore is delivered by railroad and aerial tramway. The Alexander Maitland has attained success at its 40-stamp, wet crushing cyanide plant, and is also shipping to outside smelters. It has added largely to its mining and milling machinery, including a large compressor, which gives increased pressure and consequently increased ventilation. The Portland & Clinton M. Co. are mining in the old workings and making occasional shipments to the cyanide plant of Lundberg, Dorr & Wilson, and to outside smelters. The Wasp No. 2 M. Co. is putting in new machinery, consisting of additional crusher and rolls, to avoid loss of time from closing down when repairs are necessary. An improved system of mining is being inaugurated at the mine, which will make possible still greater improvement.

#### Custer County.

(Special Correspondence).—At the Clara Belle M. Co., 1½ mile from Oreville, on the Burlington R.R., 7 miles from Custer, the shaft is down 240 feet, and they are drifting in a vein of rich ore from 8 to 10 feet wide. There is a new 60 H. P. boiler and steam hoist and pump and a mill house with 2-stamp Tremaine mill, now running one shift, but will soon start on double shift. The company will put in a 10-stamp mill with cyanide tanks for treating the tailings.

Custer, Jan. 22.

#### Lawrence County.

The 60-stamp mill of the Clover Leaf mine, near Perry, is being repaired and improved and will start again in March. O. B. Amsden is superintendent.—The 500-ton smelter of the Golden Reward M. & M. Co., at Deadwood, is to be blown in soon.—W. E. Hahn of Deadwood has charge of development work on the Anaconda, on Elk creek, east of Perry.—The Imperial G. M. & M. Co. will add crushing machinery and leaching tanks, so as to increase the capacity to 300 tons per day, 200 tons being present maximum capacity. J. T. Milliken of Deadwood is mill superintendent and R. S. Jamison of Deadwood general manager.—The Aurizone M. Co., N. H. Conger of Custer secretary, contemplates building a 100-ton cyanide plant to treat the ores from its mines, 1½ mile north of Galena.—The Victoria G. M. & M. Co. proposes to build a 200-ton cyanide plant at Maurice. G. S. Jackson of Deadwood is manager.—A 200-foot shaft is to be sunk on the Ruby, in the Bare Butte mining district, 1 mile from Galena. J. Conzett of Deadwood has charge.—J. T. Harrington of Deadwood, owner of the Fairview mine and 10-stamp mill near Mystic, intends to build an aerial tramway from mine to mill.—On Iron creek, 3 miles northwest of the Spearfish mine, at Ragged Top, W. H. Disney of Terry proposes to install a hoisting plant for the Iron Creek mine. C. A. Carlson of Terry is mine superintendent.

#### Pennington County.

J. B. Taylor of Rochford, president of the Burlington Co., working at Friday gulch, intends to put in a hoist. The shaft is 150 feet deep.—A. R. Arundel of Hill City is building a mill for the Gopher mine.

### WASHINGTON.

#### Okanogan County.

The Palmer Mt. Tunnel Co., at Loomis, will put in an electric plant on Toats Coula creek and put in a large air compressor plant to aid in driving the tunnel 4000 feet farther.—The Grand View M. Co. will put a 20-stamp mill on its property on Mt. Chopaca. Machine drills are to be put into the mine. The mill is to be run by electricity generated by a plant to be built by the company at the mine.—The Mineral Hill M. Co., near Conconully, will put in an electric plant on Salmon creek to furnish power for the machine drills driving the tunnel and for an electric railway to connect the mine with the boat line on the Okanogan river.

#### Spokane County.

The Roselle M. Co. is producing tungsten at Deer Trail, in the Cedar Canyon camp, northwest of Spokane. W. S. Thyng says that the lode is 20 inches between walls, with a quartz filling, and 200 feet of development has been done. He expects to put up a concentrator in the spring.

### FOREIGN.

#### AUSTRALIA.

##### New South Wales

The gold yield of New South Wales for December, 1904, was 40,414 ounces, valued at £121,373, as compared with 8000 ounces, valued at £30,488 in December, 1903. The yield for the whole year was 324,996 ounces, valued at £1,146,109, as compared with 295,778 ounces, valued at £1,080,029 in 1903.

### BRITISH COLUMBIA.

#### Atlin District.

This district is devoted almost entirely to gravel mining, producing over \$600,000 in 1904. The latest available reports show the following companies to be operating: The British-American Dredging Co., O. T. Switzer, general manager, at Pine creek; the Pine Creek Power Co., L. H. Griffith, manager, and M. W. Loveridge, hydraulic superintendent; the Willow Creek M. Co., F. H. Brackett, manager, at Pine creek; the Eastern Hydraulic M. Co., on south side of Pine creek, above Discovery, J. M. Deeks, manager; the North Columbia G. M. Co., J. M. Ruffner, manager, at Pine creek. Regarding the work of these during 1904 the British Columbia Mining Record reports that the Willow Creek M. Co. proposes to add to their plant and increase the force. The Pine Creek Power Co. has worked a large area of the benches on the south side of Pine creek, below Discovery. Dynamite was used successfully to loosen the gravel. The company let a contract for the construction of several hundred feet of ditch to replace a flume that previously was the cause of much trouble. The North Columbia M. Co., purchasers of the Leeks &



Stewardsyke leases and quartz properties in the district, confined operations this year to opening up a new pit on the north bank of Pine creek, using the water from the Weeks ditch to loosen the dirt. Considering the amount of preliminary work to be done before commencing active operations, the result of the company's work is highly satisfactory. The company owns a large area of ground known to contain two distinct pay streaks or channels and with further development the gold recovery per year should yield large profits. The company also prospected the Stovendyko, with intent to work next season. Spruce creek benches were worked by individuals. The Con. Spruce Creek Placers Co., C. B. Gaddis, manager; H. Haslitt, hydraulic superintendent, opened and worked one pit on lower Spruce creek, reaching the Spruce creek pay channel with encouraging results. Other companies on Spruce creek are the Gladstone, S. O. Wheelock, manager; the Columbia Hydraulic M. Co., E. F. Meisner, manager, and the Blue Canyon, R. A. Jackson, manager. Ruby creek was successfully prospected preparatory to considerable work next summer. The Bull Creek Hydraulic Syndicate carried on extensive prospecting on Bull creek, a tributary of Dixie creek. On upper Spruce creek, O. F. Switzer is manager for a company building a dredger similar to the one operated by the British-American Co. on Gold Run. On Boulder creek, Grant & Black are working some of the ground of La Societe Miniere de la Columbie Britannique, of which H. Maluin has been local manager. On Birch creek, A. B. Williams is manager of the Atlin Lake Co. The McKee Creek Con., the purchasers of the holdings and plant of the Nimrod Syndicate in Atlin district this year, hydraulicked the benches of McKee creek. This company is under the management of the Samslow Bros., who report a most successful season's work, which yielded a return of some \$70,000, the largest return yet obtained on McKee creek. Other companies that have been interested here are: The Atlin M. Co., R. D. Featherstonhaugh, manager, and M. Brophy, hydraulic superintendent; the McKee Con., C. Christopher, manager.

#### Boundary District.

Regarding the Nickel Plate mine on Nickel Plate mountain, 5 miles by trail from Hedley, the Hedley Gazette says that the mine is operated by the Yale M. Co. and the rest of the work, including ore haulage, flume, stamp mill, cyanide plant and power house, is done under the name of the Daly Reduction Co. M. K. Rodgers is general manager of both companies. G. P. Jones is superintendent of the mines; W. P. Rodgers, chief engineer of construction, surface and underground; A. H. Brown, superintendent of stamp mill and cyanide plant; J. C. R. Cootes, superintendent of power and electric plants; E. R. Kelzer, draftsman; G. P. Lyon, foreman of surface gang. The ore body may be described as a mineralized zone of sedimentaries crushed between bodies of andesite. The value is found in the auriferous mispickel. The development has been almost entirely by tunnel. The main or lower tunnel has been driven about 1000 feet and exploratory drifts to ascertain the extent and value of the ore body have been run in different directions, both on this and the upper tunnel. The first of these drifts was along a fault plane to a point underneath the glory hole, and an upraise was made of 150 feet, connecting the glory hole with the main tunnel by two chutes, the extra one being available in case of accident to the other. The mill is supplied with ore from the glory hole, 15,000 tons having been taken out and carried 18,000 feet by tram to the mill at Hedley. For the first half of this an altitude of 4700 feet had to be overcome, and on the upper half less than 400 feet. The lower half is traversed by a gravity tram and the upper half, with its flatter grade, by an electric tramway, 9000 feet long, built on a maximum grade of 5% and a minimum of 2%. This is equipped with twenty-two cars of 2 tons capacity each, and drawn by a 15,000-pound electric motor, to which will soon be added another motor of 20,000 pounds. The electric current for the trolley is generated at the power house by a generator driven by water from the penstock and transmitted as a 2200-volt alternating current to the head of the gravity tram, where it is transformed to a 550-volt direct current. No power is required to haul the ore from the mine on the electric portion, which, being all down grade, enables the ore trains to run of themselves, controlled by the brakes, power only being required to start the load and pull back the empty train. The ore is brought from the tippie by a gravity tram to the ore bin. From the bin it passes through a chute onto a 10-foot grizzly with 1-inch spaces between the bars. After the fines have been taken out by the grizzly, the coarser rock passes into the 10x20 Blake crusher. This crushes to 1½ inch, and after passing over another grizzly the oversize goes to a 6x20 crusher of similar pattern. From this it drops onto a belt conveyor which carries it over the large ore bin when it drops onto another belt conveyor running at right angles. This is used to distribute the ore along the entire length of the 2000-ton storage bin. The mill has forty stamps, each weighing 1050 pounds, with 7-inch drop, 92 per minute, 6-inch discharge through 20-mesh screen; amalgamating plates have grade of 1½ inch per foot; the concentrates are saved on sixteen Frue vanners, eight more are to be added, the tailings pulp being leached and cyanided; electricity, generated by water power, is used throughout.

The Montreal & Boston Copper Co. are considering equipping their smelter at Boundary Falls with electric power. There are three furnaces, 40x176 inches at the tuyeres, of 400 tons daily capacity, with automatic samplers, crushers, rolls, belt conveyors and a 250-light dynamo. A. I. Goodall is smelter superintendent.

#### Carlboo District.

(Special Correspondence).—A scheelite mine has been discovered near Barkerville, containing 10% and upwards of scheelite showing 78% of tungstic acid.

Barkerville, Jan. 20.

J. McRae is ready for piping his hydraulic property at Quesnel Forks.

#### Kootenay District.

The Lardeau Valley Mines, Ltd., propose to put up

milling and concentrating works at the mouth of Tenderfoot creek, to work the mines of the John L. Liza and Handy veins. The Hendy is 1½ miles south of Gerard. W. N. Brayton of Spokane, Wash., is president and J. Mackenzie secretary.

#### Lardeau District.

The Eva mill, near Camborne, has been started for the first time since operations were suspended last August owing to the tram and mine buildings being burned out by forest fires. All the machinery has been overhauled. The tram which has been rebuilt has started. Construction of the tram, which will connect the upper workings with the main tram, is progressing well, all the towers being in position. When this tram is completed, ore for mill treatment will be available from all parts of the mine.

#### Nelson District.

P. Clark of Spokane has bonded the Queen mine at Salmo from J. A. Turner, W. Waldie and M. Scully and the Kootenay Belle from Bennett & Billings of Salmo. The B. C. Standard M. Co. of Nelson will put a crusher at the Hunter V to break the ore before sending it over the tram. The main double-rope aerial tramway to the railway is 13,000 feet long.

#### Rossland District.

The metallic output from the Granby smelter for 1904, estimating the output for December, was: Gold, 50,694 ounces, at \$20, \$1,013,880; silver, 217,472 ounces, at 57 cents, \$123,949; copper, 17,843,399 pounds, at 12.8 cents, \$2,283,955; total, \$3,421,784. The totals are 401,921 tons for 1903, and 596,252 for 1904. Of this latter amount, the company's own mines at Phoenix furnished 549,703 tons, leaving a balance of 46,540 tons that came from outside mines in the Boundary, Republic, Ymir, Rossland and Orient and other camps. The six furnaces, 44x160 inches, have a nominal daily capacity of 2100 tons; they treated an average of over 1600 tons daily. The ore is practically self-fluxing, and is charged as mined without milling or concentration. The product of the first fusion is a 60% matte, which is blown up by converters to 99% blister copper. There is a 20-ton reverberatory tilting furnace. Slag is granulated.

The report of the Le Roi No. 2, Ltd., for the year ended Sept. 30, 1904, shows that as a result of the year's working, 23,020 tons of ore were shipped to the smelter and 10,331 to the concentrator. Of the former, 21,680 were from the Josie mine, and gave an average of \$24.80 per ton, as against \$20.69 for the previous year. The 23,020 tons shipped realized \$638,410, inclusive of an estimated amount of \$33,000 for ore in transit. The cost of mining, diamond drilling and general expenses in Rossland amounted to \$150,747, leaving a gross profit of \$217,663, but from this has to be deducted London expenses and \$60,529 written off for development and depreciation. The gross value recovered is \$3.15 per ton, of which \$2.02 was from the Wilfley tables and \$1.13 by oil. J. W. Astley is general superintendent.

#### MEXICO.

##### Chihuahua.

The new shaft on the Capazaya at Parral is down 310 feet.

The electric hoist has been started at the El Duque shaft of the San Nicolas M. Co.—The Sierra Madre is hoisting 350 tons of ore a week and is shipping. The pumps have been working continuously since started and the mine is sufficiently unwatered to allow drifting at the 600-foot level.

##### Durango.

The Guanacevi Tunnel Co., recently organized with a capital of \$5,000,000 gold, will commence work on the 10,000-foot tunnel they are to drive in the Guanacevi mining district. It is to be 8 feet high and 12 feet wide and will have a double tramway track for the entire length. The officers of the company are H. Losoya, president, at Guanacevi, and F. Griese, treasurer, at Parral.

At Mapimi the Compania Minera de Penoles in 1904 mined 160,841 tons of ore containing 22,771 tons of lead; 241,000 tons of ore were smelted with a net profit of \$2,303,990.44 Mexican. The shaft is now 2950 feet deep. In 1904, approximately 175,000 tons of ore were mined, assaying eighteen ounces silver per ton, 0.15 ounces of gold per ton and 15% to 16% lead; 240,000 tons of ore were smelted, one-quarter being siliceous fluxing ore, purchased principally from Parral. Nearly one-quarter of the ore mined is sulphide. The Huntington-Haberlein process is now in operation with a capacity of 300 tons daily. The Mapimi M. & S. Co., operating the America mine, and the San Juan M. Co., also operating at Mapimi, have both developed some ore during the year.

The Mining Journal reports the following mines in Mapimi as working on a regular scale: Ojuela, Socavon, Concepcion, Santa Rita, San Judas, all of the Sierra La Bufa district, and owned by the Penoles Mineral Co., S. A. Descubridora, Descubridora; owned by the Cia. Minera y Fundidora, Descubridora. La Reina, Santa Librada; owned by Miguel Torres & Co., C. Lerdo Dgo., and worked by the Penoles Mineral Co. The following have been working on a small scale: La America, Sierra La Bufa; owned by the Cia. La America, S. A., and worked by the Cia. Minera y Fundidora, Mapimi. San Juan, Sierra La Bufa; owned by the San Juan M. Co. Providencia, Talpa, Sierra La Bufa; owned by Pedro Moreno, Mapimi, Durango. Siderita, Descubridora; owned by the Siderita M. Co., S. A.

##### Guanajuato.

The Mining Journal says that the following mines in this district have been working on a regular scale: Sirena, owned by the Guanajuato Con. M. & M. Co.; Tunnel of San Francisco, owned by the El Cubo M. Co. (English); Peregrina, owned by the American Co.; El Cedro, owned by the El Cedro y Anexas, S. A.; El Pinguico, owned by Amado Delgado & Co.; Cata, owned by Guanajuato Reduction & Mines Co.; Jesus Maria & Villalino, owned by the executors of F. de P. Castenada; La Asuncion, owned by Atanasio Rocha. The following were worked on a small scale: Valenciana, owned by the Guanajuato R. & M. Co.; Penafiel, owned by Atanasio Rocha; Rayas & Mellado, owned by the Concordia

M. Co. The following metallurgical plants have been regularly worked during the month: Under the patio process—La Purisima, Cipreses and Dolores de Granaditas. Grinding pans—San Francisco de Pastita, owned by the Guanajuato Con. M. & M. Co. Concentration process—Machinery has been erected at the Peregrina mine, for the purpose of treating ores with cyanide of potassium. This machinery is worked by electric power.

##### Sinaloa.

Negociacion Minera de Guadalupe de los Reyes (Mazatlan) are working the Candelaria and Estaca y Descubridora at Cosala.—The thirty stamps of the Dulces Nombres, Canes, are crushing seventy tons daily from the Estaca, tailings from the Wilfleys being cyanided, giving from 50% to 70% extraction and costing \$7 to \$8 per ton.

A. Sanchez, H. E. Gaxiola, C. Vilderrain and E. Vasquez, owners of the Alianza and Morelos mines in the Badiraguato district, have decided to erect reduction works near the mines.

##### Sonora.

(Special Correspondence).—One-half the new concentrator of the Cananea Con. Copper Co. has been completed and is in operation. The capacity, when entirely finished, will be 1000 tons daily.—V. R. Parker has denounced 36 pertenencias in La Brisca district.—W. J. Powers, vice-president of the Calumet & Sonora M. Co., has gone East to purchase machinery.—The Cubao M. Co., G. H. McLean superintendent, at Arizpe, hopes to resume work in a short time. Cananea, Jan. 23.

It is reported that the La Chumata M. Co., working in Arispe district, 45 miles from Poza, will put in a fifty-ton mill. B. F. Scheffels is president and H. Baldwin secretary, at 159 La Salle St., Chicago, Ill.

#### NEW ZEALAND.

The gold output of New Zealand for December, 1904, was 28,531 ounces, valued at £112,017, as compared with 49,794 ounces, valued at £193,261 for the corresponding month of 1903. The total output for the year was 519,720 ounces, valued at £1,987,501, against 533,314 ounces, valued at £2,037,831 in 1903.

## Personal.

F. L. WHIPPLE is superintendent of the Federal Loan mine at Nevada City, Cal.

E. JENKS is superintendent of the Vesuvius mine, at Bohemia, Lane county, Or.

J. A. WARNER of Reno is at Virginia City, Nev., examining the Comstock mines.

F. GARRETSON is manager for the Garretson M. & S. Co., at Calera, Sonora, Mexico.

J. I. ORBISON, secretary of the Hawkeye M. & M. Co. of Nezperce, Idaho, is at Louisville, Ky.

J. D. ROBERTSON is superintendent of the Guadalupe mines, Villaldama, Nuevo Leon, Mexico.

C. G. DENNIS has been appointed superintendent of the Rawhide mine, Towle, Placer county, Cal.

ED. CHAMBERLAIN is superintendent for the Yaqui C. Co., Suaqui de Batuc, Santo Nino, Sonora, Mexico.

N. O. BAGGE of Los Angeles, Cal., is visiting his mines in the Almoloya district, Parral, Chihuahua, Mexico.

C. M. FUELLER, Denver, Colo., is in Atlantic City, Wyo., starting the 100-ton cyanide plant of the Dexter M. Co.

J. PARKS has been appointed superintendent of the Hawley-Gardner mine, on Quartz Hill, near Central City, Colo.

A. C. MORRISON has resigned as superintendent of the Rio Vista copper mine, near Fairplay, El Dorado county, Cal.

W. W. ELLIOTT has finished the construction of the Lucky Tiger mill at Sonora, Mexico, and will return to Prescott, Ariz.

A. S. HASKELL is superintending the building of the new plant of the Mountain C. Co., at Bull's Head Point, Contra Costa county, Cal.

J. CRONIN has been made general manager of the War Eagle and Center Star mines, at Rossland, B. C., succeeding E. B. Kirby.

G. H. ROBINSON, general manager of the Britannia copper mines on Howe sound, above Vancouver, B. C., is in Salt Lake City, Utah.

L. S. WOOD is at Denver, Colo., having resigned as manager of the Ashanti Gold Fields Corp., Ltd., Obuassi, Gold Coast Colony, West Africa.

J. C. CLANCY of Johannesburg, S. A., is making experiments at the Cripple Creek-Homestake mill on the Cripple Creek ores in Cripple Creek, Colo.

F. C. LINCOLN is manager of the Arizona G. & C. Co.'s properties at Saltillo, near Nogales, Santa Cruz county, Ariz., succeeding H. Vaughn, resigned.

C. R. DAVIS, superintendent of the Center Star and War Eagle mines at Rossland, B. C., has resigned to take the management of the Lancaster mines at Krugersdorp, South Africa.

JOHN M. BECKWITH, formerly manager of the Silver King (Ltd.) Co. of Calico, Cal., and now manager for the Nile Valley Co. in Egypt, is now in London on company business. He expects to return to the mines near Assouan in a few weeks, when extensive additions will be made to the hoisting and pumping equipment at the mines.



## Commercial Paragraphs.

THE Kilgore-Peteler Co. of Minneapolis, Minn., has absorbed the Kilgore Machine Co. and the Peteler Portable Railway Mfg. Co.

THE Redfield Drill Co., 1606 Blake St., Denver, Colo., recently shipped one of their hand power rock drills to the Moffat Lake & Reduction Co. at Gorham, Colo.

QUEEN & CO. of Philadelphia, makers of scientific appliances, have removed their instrument factory from Filbert street to the Cornelius building, 817-831 Cherry Street.

THE United Zinc & Chemical Co., whose establishment was recently destroyed by fire, are rebuilding and will continue business. Their office is 318 Dwight building, Kansas City, Mo.

THE Mine & Smelter Supply Co. of Denver, through their New York office, has received orders from the El Cobre mines for twenty-four Willey tables and six slimmers for their works at Santiago de Cuba.

THE Westinghouse Electric & Manufacturing Co., Pittsburgh, Pa., have opened an office at 429 Seventeenth street, Denver, Colo. Mr. L. M. Cargo, manager of the Salt Lake City branch of the Westinghouse Co., will have charge of the Denver branch.

THE Davenport Locomotive Works, Davenport, Ia., have spent \$30,000 in increasing their equipment. They have added a new power plant 80x160 feet, machine shop tools, generators, motors, etc. This expenditure is due to the increased business of the company. They recently shipped a locomotive to the Great Western Gold Co. at Logot, Shasta county, Cal. This locomotive is made to go into a 5-foot 2-inch tunnel. The Pacific coast representative of the Davenport Locomotive Works is J. C. Martin Jr., 117 New Montgomery street, San Francisco, Cal.

THE Pelton Water Wheel Co., 124 Main street, San Francisco, Cal., and of New York, report sales of a 700 H. P. Pelton wheel to the Grande Ronde Electric Co. of Oregon, to operate under 877 feet pressure, and a 450 H. P. Pelton wheel for the Nanaimo Electric Light & Heating Co. of British Columbia. The Silver Lake mines of Colorado have ordered a 600 H. P. Pelton wheel, to be direct coupled to a 400 H. P. Allis engine, to drive generators in the power plant. A 450 H. P. Pelton wheel unit is being made for the Government of Hawaii, and a 900 H. P. unit for the La Grande Water Storage Co. of Oregon.

## Books Received.

"Comparison of a Wet and Crucible-Fire Methods for Assay of Gold Telluride Ores" by W. F. Hillebrand and E. T. Allen, Bulletin 253 of the United States Geological Survey.

"Kittanniog Folio," Pennsylvania, No. 115 of the Geologic Atlases of the United States, published by the United States Geological Survey, deals with general geology of region, together with economic coal, oil and natural gas occurrences.

"The Stone Industry in 1903" is the latest of the series of Mineral Resources of the United States, issued by the United States Geological Survey. A review of figures shows an increasing production of crushed stone, but a slight decrease for the year in building stone. The report gives statistics on production and tests of stone from all of the States.

The difficulties of obtaining accurate information regarding mineral production is well exemplified upon comparing "The Mineral Resources of the United States for 1903," by D. T. Day, published by the United States Geological Survey, and "The Mineral Industry for 1903," as published by the Engineering and Mining Journal. The former states the total value of the mineral production during 1903 to have been \$1,419,721,569, while the latter gives the net value as \$1,474,275,125. The gold and silver production obtained from the mint reports are the same, but the base metals and non-metallic products, particularly coal, vary greatly. The "Mineral Industry" has considerable information regarding foreign production. It seems to be up to the standard set by the preceding eleven volumes.

## Trade Treatises.

Catalogue No. 9 of William R. Perrin & Co., Forty-sixth, Loomis and Bishop streets, Chicago, Ill., is devoted to pictures and descriptions of filter presses and filter press supplies. It will be sent to those interested upon request to either the Chicago or Denver office.

Catalogue No. 56 from the Whitman & Baroes Mfg. Co., West Pullman, Ill., is a fine example of a trade treatise, the illustrations and text elaborately portraying their extensive line of drill bits, chucks and cases, reamers, taps, wrenches and other tools. S. J. Cooger, 519 Mission St., San Francisco, Cal., is their Pacific coast representative.

## Obituary.

J. K. MACKENZIE of Chicago was murdered by Yaquis, near Hermosillo, Sonora, Mexico, on Jan. 19.

## Latest Market Reports.

SAN FRANCISCO, January 27, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 28<sup>3</sup>/<sub>4</sub>d (standard ounce, 925 fine); New York, bar silver, 61<sup>1</sup>/<sub>2</sub>c, refined (1000 fine); San Francisco, 61<sup>1</sup>/<sub>2</sub>c; Mexican dollars, 51c, San Francisco; 47<sup>1</sup>/<sub>2</sub>c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37<sup>1</sup>/<sub>2</sub>@15.50; Electrolytic, 1 to 3 casks, \$15.37<sup>1</sup>/<sub>2</sub>; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £67 15s spot per ton.

LEAD.—New York, \$4.55; Salt Lake City, \$3.50; St. Louis, \$4.12<sup>1</sup>/<sub>2</sub>; San Francisco, \$4.50, carload lots; 4<sup>1</sup>/<sub>2</sub>c 100 to 4000 lbs.; pipe 6<sup>1</sup>/<sub>2</sub>c, sheet 7, bar 5<sup>1</sup>/<sub>2</sub>c; pig, \$4.85. London: £12 12s 6d per long ton.

SPELTER.—New York, \$6.20; St. Louis, \$6.30; London, £24 17s 6d per ton; San Francisco, ton lots, 6<sup>1</sup>/<sub>2</sub>c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.25@29.75; San Francisco, ton lots, 30c; 500 lbs., 30<sup>1</sup>/<sub>2</sub>c; 200 lbs., 30<sup>1</sup>/<sub>2</sub>c; less, 31c; bar tin, 32<sup>1</sup>/<sub>2</sub>@35c. London, £130 15s spot.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 15s; San Francisco, local, \$39.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6<sup>1</sup>/<sub>2</sub>c; extra, 17<sup>1</sup>/<sub>2</sub>c; genuine, 31<sup>1</sup>/<sub>2</sub>c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.25c.

ZINC.—Metallic, chemically pure, 50c; dust, 45c; 10c; sulphate, 10c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.85@17.10; gray forge, \$15.85; San Francisco, bar, 3c per lb., 3<sup>1</sup>/<sub>2</sub>c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$27.00; open hearth billets, \$27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6<sup>1</sup>/<sub>2</sub>c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6<sup>1</sup>/<sub>2</sub>c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@25.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILES.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 per bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 8<sup>1</sup>/<sub>2</sub>c; Hallett's, 8<sup>1</sup>/<sub>2</sub>c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9<sup>1</sup>/<sub>2</sub>c; 100-lb. lots, 10<sup>1</sup>/<sub>2</sub>c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linsseed, hoiled, bbl., 55c; cs., 60c; raw, bbl., 53c; cs., 54c; Lucol oil, hoiled, bbl., 50c; cs., 55c; raw, bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 19c; Astral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c; Elaine, 25c; Water White, in bulk, 12<sup>1</sup>/<sub>2</sub>c; Mineral Seal, iron bbls., 18c; wooden bbls., 20<sup>1</sup>/<sub>2</sub>c; cs., 24c; Mineral Sperm, cs., 26<sup>1</sup>/<sub>2</sub>c; Deodorized Stove Gasoline, hulk, 16c; do., cs., 22<sup>1</sup>/<sub>2</sub>c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naptha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19<sup>1</sup>/<sub>2</sub>c; Lard Oil, E. W. S. h., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15<sup>1</sup>/<sub>2</sub>c; less than one ton, 17<sup>1</sup>/<sub>2</sub>c. No. 1\*, 60%, carload lots, 13<sup>1</sup>/<sub>2</sub>c; less than one ton, 15<sup>1</sup>/<sub>2</sub>c. No. 1\*\*, 50%, carload lots, 11<sup>1</sup>/<sub>2</sub>c; less than one ton, 13<sup>1</sup>/<sub>2</sub>c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9<sup>1</sup>/<sub>2</sub>c; less than one ton, 11<sup>1</sup>/<sub>2</sub>c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9<sup>1</sup>/<sub>2</sub>c.

CHEMICALS.—Cyanide of potassium, 98%-99%, joh-hiog, 23@24c per lb.; carloads, 23@23<sup>1</sup>/<sub>2</sub>c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3<sup>1</sup>/<sub>2</sub>c per lb.; caustic soda, in drums, 3@3<sup>1</sup>/<sub>2</sub>c per lb.; Cal. soda, hbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of pot-

ash, 12@13c; nitrate of potash, 6<sup>1</sup>/<sub>2</sub>@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2<sup>1</sup>/<sub>2</sub>@2<sup>3</sup>/<sub>4</sub>c; powdered sulphur, 2<sup>1</sup>/<sub>2</sub>@2<sup>3</sup>/<sub>4</sub>c; flour sulphur, French, 2<sup>1</sup>/<sub>2</sub>@—c; alum, \$2.00@2.25; California refined, 1<sup>1</sup>/<sub>2</sub>@2c; sulphide of iron, 8c per lb.; copper sulphate, 5<sup>1</sup>/<sub>2</sub>@5<sup>3</sup>/<sub>4</sub>c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1<sup>1</sup>/<sub>2</sub>@2c per lb.; nitric acid, carboys, 8c per lb.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, 7<sup>1</sup>/<sub>2</sub> per lb., 80c.

PHOSPHORUS.—American, 70c.

SILVER.—Chloride, per oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, 7<sup>1</sup>/<sub>2</sub> per lb., 7c; less than 500 lbs., 7<sup>1</sup>/<sub>2</sub>c.

MAGNESIUM.—Pure, N. Y., \$1.60.

MANGANESE.—Per lb., \$2.75.

SODIUM.—Metal, 50c.

BISMUTH.—Subnitrate, 7<sup>1</sup>/<sub>2</sub> per lb., \$2.10.

URANIUM.—Oxide, 7<sup>1</sup>/<sub>2</sub> per lb., \$3.50.

MERCURY.—Bicchloride, 7<sup>1</sup>/<sub>2</sub> per lb., 77c.

TUNGSTEN.—Best, 7<sup>1</sup>/<sub>2</sub> per lb., \$1.25.

FIRE BRICK.—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. h., factory, \$8.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

CAR VENTILATORS.—No. 779,755. Jan. 10, 1905. J. E. Armstrong, Santa Cruz, Cal. This invention relates to a means for ventilating cars and the like in such a manner as to remove the vitiated air from the apartment and at the same time prevent the introduction of air in such a manner as to create disagreeable drafts. The invention consists in so mounting the window or closure of the window opening that it may be moved either in its entirety or sectionally, so that a proportionately small opening is presented in the direction toward which the train is running or from which the air draft proceeds, and a larger opening is presented in the opposite direction, so that it will produce a species of suction and remove the air from the compartment, while the suction thus set up through the large and small openings will not be such as to cause a draft within the apartment.

CAN TESTING MACHINE.—No. 779,719. Jan. 10, 1905. P. Kruse, Astoria, Or. One-third assigned to the Astoria Iron Works, of Astoria, Or., a corporation. This invention has for its object the protection of a machine for testing sheet metal cans, and it consists in devices for automatically receiving the cans and mechanism for holding or clamping the can against a pressure chamber. Another object of the invention is to provide improved means for automatically finding and discharging leaky cans through a false bottom in the runway provided for delivering tight cans, thereby dispensing with an operator. A further object of the invention is to provide improved means for testing cans without wetting them, thereby dispensing with a drying machine. It consists in various novel devices and combinations of parts which form the improved and completed machine.

SAW FILING MACHINE.—No. 780,232. Jan. 17, 1905. M. P. Schell, San Francisco, Cal. Assigned to Folkers Saw Filing Machine Co. of San Francisco, Cal., a corporation. This invention relates to improvements in saw filing machines, and particularly to that type of machines employing power driven helical file members. The object of the invention is to provide a positive means for advancing the file carriage and rotating the file members at uniform speed and to provide a novel means of mounting the files whereby they will act upon the teeth in a manner to produce the best result in conformity with usual saw setting methods.

FLYWHEEL BRAKE.—No. 780,184. Jan. 17, 1905. A. G. Hubbard, San Francisco, Cal. One-half assigned to B. S. Hubbard of San Francisco, Cal. This invention relates to a brake which is especially designed for application to fly and other wheels connected with machinery where it is desirable to make quick stops and releases. The device comprises a shoe having a frictional surface thereon, there being inclines carried by the lower part of the shoe and corresponding fixed inclines upon which those carried by the shoe are slidable; a spring pressed foot lever and connection between it and the shoe whereby the latter is advanced and raised into contact with the wheel rim and an adjustable stop to limit the forward movement of the shoe.

BELT CONVEYER.—No. 780,145. Jan. 17, 1905. L. K. Vaughan, Oroville, Cal. This invention relates to improvements in street belt conveyers for handling coal, sand, gravel and like coarse heavy granular matter, and pertains especially to tailings stackers for gold dredgers. The object of the invention is to prevent the disastrous wear that now occurs with belt carriers of the above type, and thereby save or lessen to a great degree the expense of frequent renewal of the belts. It comprises an endless belt conveyer having a separate and readily removable central protective shoe or wearing pad on its supporting surface, said pad of lesser width than the conveyer, and other details of construction.

AERIAL CABLEWAYS.—No. 780,127. Jan. 17, 1905. J. S. Rees, Loyalton, Cal. One-half assigned to W. S. Lewis of Loyalton, Cal. This invention relates to aerial cableway, and especially to a system adapted for logging purposes. The object of the invention is to provide a suitable logging system which shall be simple and cheaply and easily installed, which can be strung to indefinite lengths through the forests and made to transport logs either bodily or by dragging them along the ground, and which can be run on irregular lines and made to turn as many corners as necessary or desired.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JANUARY 17, 1905.

780,475.—SAW.—S. J. Benz, San Francisco.  
780,157.—BLOCK DIRECTORY.—G. Cadenasso, San Francisco.  
780,322.—TOOL HOLDER.—M. N. Callender, San Francisco.  
780,159.—CLUTCH.—W. H. Corbett, Portland, Or.  
780,031.—CONCENTRATOR.—F. E. Forster, Clifton, Ariz.  
780,171.—TALKING MACHINE.—F. C. Hassett, Kelso, Wash.  
780,184.—FLYWHEEL BRAKE.—A. G. Hubbard, San Francisco.  
780,038.—PIPE GRIP.—E. G. Huntington, Santa Ana, Cal.  
780,293.—LEACHING.—T. B. Joseph, San Francisco.  
780,211.—AXLE.—A. C. Massey, Los Angeles, Cal.  
780,373.—WATER ELEVATOR.—T. H. McDonald, Elk Grove, Cal.  
780,319.—MUSIC LEAF TURNER.—F. B. McMillan, San Francisco.  
780,121.—CAN OPENER.—T. T. Merriman, Medford, Or.  
780,127.—AERIAL CABLEWAY.—J. S. Rees, Loyalton, Cal.  
780,228.—STOVE.—E. H. Richardson, Ontario, Cal.  
780,232.—SAW FILING MACHINE.—N. P. Schell, San Francisco.  
780,144.—RIPPER.—J. K. Van Winkle, Sumpter, Or.  
780,145.—BELT CONVEYER.—L. K. Vaughan, Oroville, Cal.  
780,467.—BLAST HOLE LOADER.—W. T. Wright, Bisbee, Ariz.  
39,266.—DESIGN.—N. J. Boyle, Los Angeles, Cal.



# MINING AND SCIENTIFIC PRESS

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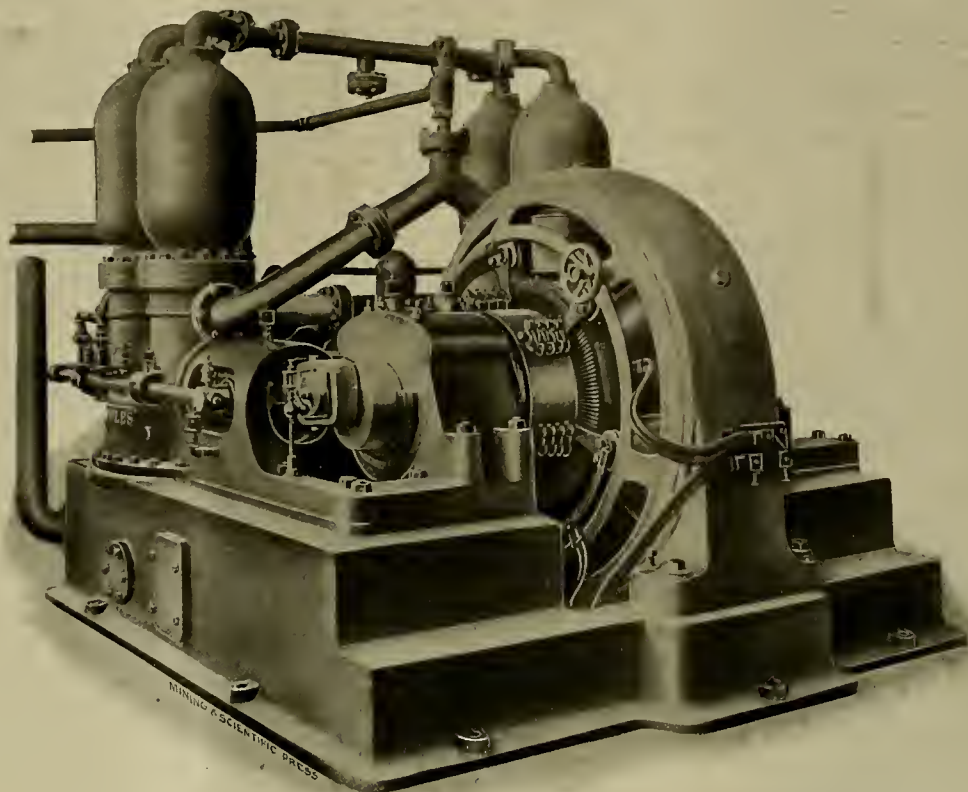
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## Unwatering the Comstock.

When the lower levels of the Comstock lode, Virginia City, Nev., were abandoned years ago, there were few that even entertained a hope that the bottom of the deep workings would ever be seen again. Floods of scalding water, and the constantly increasing expense, together with the fact that no important bonanza was in sight, were the causes which led to the abandonment of the lower levels, and the workings were permitted to fill until the water, rising, flowed out of the Sutro tunnel. After years of idleness, below that level, the several companies in the Virginia City section of the lode organized as the Comstock Pumping Association. In 1899, the hydraulic elevator was successfully installed in the Con. California & Virginia shaft and, in a few months, the water of this central section had been lowered several hundred feet and mining was resumed again below the adit level—the Sutro tunnel. In time a series of electrically driven pumps was installed on the 2150 level of the Con. Virginia mine, in a great chamber cut out of the rocks and substantially timbered. These pumps took the water raised from the 2350 level by the hydraulic elevator, and sent it to the Sutro tunnel level. It was demonstrated that an equipment, costing less than one-tenth of some of the single installations of the Cornish type which had been placed on several of the mines, was abundantly able to do the work of half a dozen of these former great installations. The introduction of electric power on the Lode at once reduced the cost of power from \$20 per horse power per month to \$7 per month—a very material reduction in expense.

The illustration of the electric pump on this page is that of the latest installation on the Comstock. It is at the Ward shaft, in the Gold Hill section, and by its use it is hoped to unwater the workings of that portion of the lode to the bottom of the shafts which were sunk there prior to their abandonment, when an unexpected scalding flood from the Exchequer workings drove the miners from the lower portion of the mine. This pump is fully described elsewhere herein.

Those familiar with the conditions on the Comstock, and acquainted with the difficulties to be overcome,



Direct Driven Electric Mine Pump, Ward Shaft, Gold Hill, Comstock Lode, Nevada. (See Page 73.)

## Progress in Africa.

It is only ten years since Rhodesia came to be known to the civilized world. In the maps of a decade past the portion of South Africa now known as Rhodesia was marked Matabele Land. Rumors came out of that unknown region through the medium of hunters, missionaries and traders that the land abounded in ancient mines and was rich in gold. As long ago as 1860 Dr. Livingstone, the explorer, said of the region about Tete, a native village on the Zambesi, that the entire country over an area several

the ancient resources. One of the engravings on this page illustrates the march of civilization into the heart of the "Dark Continent" from the southward. The plant presents an appearance not unlike plants for like purposes in the older civilized parts of the world. To the northward, beyond the Zambesi river in the Congo Free State, copper, iron and gold mines are being developed, and the influences of these two regions are sure to radiate outward, and in time the entire country between them, at present almost unknown and inhabited only by the natives, will be settled by the progressive Caucasian race and be.



A Gold Mill and Cyanide Plant, Rhodesia, South Africa. (See Page 72.)

confidently anticipate the success of this newest enterprise, and it may not be many months before the work of exploration will be resumed in the old deep workings—and the shafts will probably be sunk deeper than before.

miles square showed evidence of having been worked for alluvial gold. At present little or nothing is being said of Tete and its vicinity, but about Bulawayo the ancient workings have been explored, and there are numerous companies at work there developing

come the center of great industrial life. Railways are already being built through this country, and this, together with the development of the vast power of the great falls of the Zambesi—Victoria falls—will hasten its settlement and civilization.



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THE cause for the direction of an air current being reversed through shafts connected by mine workings is not always clearly evident, but such does at times occur. At the time of a great fire in the Yellow Jacket mine at Gold Hill, on the Comstock, an upcast shaft became a downcast. At a fire in the Charters Towers district, Queensland, Australia, which occurred several weeks ago, a similar occurrence was noted. In this latter instance the cause of the reversal of the air current was fully determined. Some believed it to be due to the turning a stream of water down the shaft, which imprisoned a large volume of air as it fell, forcing the air current in an opposite direction to that which it had previously followed naturally. Others thought it due to the falls of rock and debris in the lower portion of the shaft which bulkheaded the workings and forced the imprisoned air and the gases of combustion to rise through the downcast shaft. Subsequently it was learned that it was due to falls of the hanging wall. In this fire a number of miners lost their lives by inhaling carbon dioxide—the result of the burning of the timbers. In this connection the official inspector of mines makes the statement that neither the management nor the miners were aware that burning timber could supply this deadly gas, and did not realize the danger attending an effort to extinguish the fire by working in its vicinity underground. Miners should be instructed in these matters, and in mine ventilation generally. When mine fires occur men sometimes attempt heroic deeds which in times of less excitement and danger they would not contemplate for a moment, but the miner has never yet been found deficient in courage when the lives of his fellow workmen were at stake. Some make the venture to save lives first, and study the chemistry of combustion of mine timbers later if they have the opportunity.

## State Mining Legislation.

In a recent decision of the Supreme Court of the United States Justice Brewer sustains a decision of the Montana Supreme Court, which is of importance, in that it recognizes as constitutional the legislation of the several States in making laws not in conflict with the Federal Statutes. The United States law fixes the minimum requirement in making locations, but to this requirement the State Legislatures, and the miners themselves of the organized districts, may lawfully make rules prescribing the acts necessary to constitute a valid claim location. Some States require a stated amount of work to be performed, and other acts done within a given period—sixty to ninety days—which is really a part of the act of location, and these requirements are in addition to those required by the Federal Statutes. Montana is one of the States in which this supplementary legislation has been enacted. The decision of the United States Supreme Court above referred to was in the case of the Butte City Water Company plaintiff in error against B. Baker, in which appeal was taken from the decision of the Montana court. In conclusion Judge Brewer said:

The Montana statute, among other supplementary regulations, provided that the declaratory statement filed in the office of the clerk of the county in which the lode or claim is situated must contain "the dimensions and location of the discovery shaft, or its equivalent, sunk upon lode or placer claims," and "the location and description of each corner, with the markings thereon." A failure to comply with these regulations was the ground upon which the Supreme Court of Montana held the location invalid. It is contended that these provisions are too stringent, and conflict with the liberal purpose manifested by Congress in its legislation respecting mining claims. We do not think that they are open to this objection. They certainly do not conflict with the letter of any Congressional statute; on the contrary, are rather suggested by Section 2324. It may well be that the State Legislature, in its desire to guard against false testimony in respect to a location, deemed it important that full particulars in respect to the discovery shaft and the corner posts should be at the very beginning placed of record. Even if there were no danger of false testimony it was not unreasonable to guard against the resurrection of incomplete locations when by subsequent explorations mining claims of great value have been uncovered.

We see no error in the rulings of the Supreme Court of Montana, and its judgment is affirmed.

This decision clearly confirms the right of the several States to make mining laws not in conflict with the existing laws of the United States.

## Perverting the Facts.

One of the most regrettable things about many of the reports made by self-styled mining engineers is the distortion of facts. It is no uncommon thing to see paragraphs culled from official reports of State officers and the whole woven into an interestingly plausible fabric of misrepresentation. It may be that the property which is the subject of the report has intrinsic value, or it may remain to be demonstrated that it possesses any value at all, but the astute promoter draws attention to the indisputable fact that the property in question lies directly between two noted mines, each of which has produced millions of dollars. While this statement is true, it may be also misleading, as it may be that the two noted mines are on two distinct lodes or belts many miles apart and neither of them have anything in common with the property described by the promoter, the only claim to distinction being that it lies between them. Statements contained in these reports are often apparently so straightforward and honest as to deceive those unfamiliar with the section in which the mine is situated. Very few mines are developed and equipped without assistance from others not originally owners, and while, undoubtedly, the failures in mining outnumber the successes, this fact is largely due to the carelessness of the investors in investigating the enterprise in which they are solicited to take stock or an interest. So long as promoters confine their statements to facts, without distortion or misrepresentation, and do not so state facts as to be misleading, no one can object to the attempt to secure capital for equipment and development of new mining enterprises by the sale of stock in such concerns. Other enterprises in industrial lines secure

needed financial aid in this manner and there is no reason why mining should be an exception if no misrepresentations are made, for it is the intent to deceive that renders this class of promotion obnoxious to the real friends of the industry of legitimate mining.

## Careless Use of Powder.

A bill was recently introduced in the State Senate of Illinois providing that the operators of mines in that State shall provide men whose duty it shall be to load and fire holes. In addition to this the shot firer shall post conspicuously a bulletin giving the number of holes loaded, the number of shots missed, and giving the reason and location of such shots, if any occur. A bill of this character cannot fail to be of usefulness. The indiscriminate handling of powder and caps in mines without particular restrictions is prolific of many serious accidents, and no single legislative measure could be of greater service to large mines than that requiring that the loading and firing of holes be done by men whose particular business it is to attend to this branch of the underground work. Many mines employing a large number of men have "gunners," whose duty it is to load all holes and fire them, as contemplated in the Illinois bill, but there are many others who do not consider it necessary, but it is a noteworthy fact that there are fewer fatalities due to premature blasts, missed holes, and explosion of the powder stored at the loading bench on the level, where there is a gunner, than where no such man is employed. Miners by long contact with nitro powder become careless and indifferent to the element of danger always present, and it is due largely to this fact that many disastrous explosions occur. In many instances miners, when left to their own discretion, employ much more powder than is really necessary to break the ground. Leasers and contractors understand these things better, generally, than miners who are employed by the day, and who have no occasion to use greater care or to exercise more economy. The contractor and leaser must pay for the powder he uses and takes this into consideration when charging a hole. In coal mining the overcharging of a hole is fraught with much more danger and more grave consequences, and yet in metal mines the results of careless handling of powder are sufficient to justify some stringent means of enforcing a proper recognition of this danger upon the mine management and upon the miners themselves.

## Mine Taxation.

A bill has been recently introduced in the Washington State Legislature, the purpose of which is regulating the taxation of mines and mining property. It is provided in this bill that the net valuation of the mine shall be the basis of taxation, determined by measurement of "ore in sight." As this would naturally contemplate an expert examination of every mine in the State—a political impossibility—the bill requires that the superintendent, manager or owner shall make an affidavit of the value of ore in sight at a stated date, when assessment is to be fixed. The idea is ingenious, but has the appearance of being impracticable, for the reason that the net value of a mine changes with every shift's work, not materially, perhaps, in so short a time, but the mine manager, who is disposed to take advantage of this fact, could so manipulate his development work that, at the time of year when assessment is to be made, the mine would have little or no net value, and a few months later it may possibly have exposed many thousands of dollars' worth of ore. The bill further contemplates the assessment and taxation of improvements. In the mining industry the conditions are such that a mine may have improvements worth half a million dollars or more, and still the mine be unprofitable, while a mine worked with an outfit worth only a few hundred dollars may be at the same time a famous producer. There have been many instances illustrating both of these conditions within two or three years in southern Nevada, and they may be seen there to-day. The taxation of mining property is one of the most difficult matters to adjust in an equitable manner, and all of the mining States have had more or less difficulty with this class of legislation.



## CONCENTRATES.

GOLD most commonly occurs associated with quartz, but all quartz does not contain gold, and much gold occurs where quartz is scarce or absent entirely. Many dike rocks contain gold with no visible quartz.

ASBESTOS is found in the serpentine rock in various parts of California, but present demand is not sufficient to warrant extensive development, or the placing of machinery. The most of the crude asbestos comes from Canada.

TIN SULPHIDE is known to occur in a number of localities, but is not a common mineral. Tin is usually found in veins in the form of the oxide of tin, cassiterite, which seem to have been the original form of the mineral, and is not the result of its alteration from the sulphide as is the case with most other oxides.

THE largest diamond ever discovered is that recently taken from the Premier mine, near Pretoria, in the Transvaal, South Africa. It weighs 3022 carats—about 20.2 ounces Troy. Its value has not yet been absolutely determined. It is described as a diamond of unusual purity and brilliancy, features often lacking in large diamonds.

SHAFTS may be sunk several hundred feet without timbers, if the ground stands well. On Stockton ridge, near Mokelumne Hill, Calaveras county, Cal., shafts 250 feet in depth, sunk in early 50s, are open to-day from top to bottom, and not a stick of timber was ever in them for support of the walls. Those shafts are circular, and cut through volcanic mud and tuff. In the Calico mining district of California there are shafts 200 to 300 feet deep in which there have never been any timbers.

WHERE possible, ore should be broken in a breaker near the shaft or mouth of the tunnel, and delivered to a bin beneath, from which it may be drawn into cars and hauled to the mill, where it may be distributed to any portion of the bins where it is required. The placing of a breaker in the mill should be avoided wherever possible, and where it cannot be avoided it should be set on a separate frame of timbers, which are not connected with the main mill frame.

ONE of the most important things to give particular attention in the running of a machine drill is to see that it is kept well oiled, particularly when the machine is new. Where the distance from the floor to the back of the drift or slope is very much greater than the length of the drill column it is a good idea to build a crib-like structure 3 or 4 feet square, as a base for the blocking, and not depend wholly on a pile of small blocks with too small a superficial area, which will give an insecure foundation.

THE most important tests of steel hoisting rope are those for bending and tensile strength. A good rope must not show a variation of more than 2% in these tests. The most important of all are the bending tests. A wire rope must not be bent over too small a sheave or drum, as it causes the interior strands to wear upon each other, and the unequal strain upon the several strands of the rope may cause it to break at a time when the tensile strength of all the strands still possesses a large factor of safety.

ABOUT 2000 miles of roads are treated with crude petroleum in California. The railroad companies have also oiled hundreds of miles of their tracks for the purpose of laying the dust. The proper oil to use for this purpose is that containing a high percentage of asphalt. After the roadway has been sprinkled liberally with oil the petroleum will collect in ruts and other depressions, forming pools. This is a waste of oil, and to secure good results the application of the oil should be followed by sprinkling enough sand over the roadway to take up the surplus oil. The sand absorbs the oil and forms an artificial asphalt rock.

CINNABAR is one of the most stable of the sulphides of the base metals. It is commonly found in the surface of the veins containing mercury, and in an unoxidized condition. What is known as inflammable cinnabar occurs in the quicksilver mines of Idria, Austria, and is technically called idrialite. In the pure state it is white and has a crystalline structure, but in nature is always impure, being associated with cinnabar, clay, pyrites gypsum, etc., in an earthy, dark-colored material which is combustible—probably a variety of bitumen—and it is owing to the presence of mercury in the mass that the mineral has been called inflammable cinnabar.

USUALLY ore which has been exposed for a long time on dumps, where it has had an opportunity to oxidize, is easier to treat by the cyanide process than the ores recently extracted from the mine. This is also applicable to tailings, and is due, doubtless, to the repeated washings from rains, which wash out the sulphates as fast as they are formed by oxidation. Some silver ores are amenable to cyanide treatment, and others are rebellious. The time required is usually too long and the consumption of cyanide so high that it is usually not at-

tempted. As a general thing other processes are better adapted to the treatment of silver ores than the cyanide process. At Dayton, Nevada, gold-silver ores and tailings are being successfully treated by a chloro-cyanide process.

IN many instances where a gold-bearing vein has been faulted, it is found that the ore is far richer just above the fault than it is below it. It seems due to secondary processes, which have caused the gold to accumulate at this place. In one mine, known to the writer, a quartz vein was faulted a distance of 18 inches. The vein was horizontal in slate. The fault plane was nearly vertical. Although the vein contained gold, it was only in small amount, and the slates showed no gold and little minorization by iron sulphide. In the fault fissure, however, between the fractured ends of the vein, the material consisting of granulated quartz, slate and gouge for a distance of about 150 feet the gold values were high. Two men took out several thousand dollars in drifting 70 feet. Without doubt this deposition of gold was secondary, and may have been derived from the vein. There was no direct evidence, however, that such was the case.

THE wide difference in the cost of accomplishing the same kind and amount of work in two mines situated in the same district probably represents the difference in the character of the rock passed through. There are so many factors which go to make up the cost of shaft sinking that no close figures can be given without full knowledge of the conditions. Generally speaking, the cost of sinking a two compartment shaft 5x10 feet in the clear, in fairly easy ground, and fully timbered, should not greatly exceed, if it reaches \$40 per foot, with wages at \$3 per day. The amount of water encountered is important, and also the style of timbering adopted. The work should be so arranged as to lessen the lost time to a minimum. Lost time is an important factor. There are waits on powder gas, on skips, on men and timbers, which should be avoided as far as possible.

IN the case of sinking the shaft through loam and quicksand overlying rotten granite, it may be possible to get the shaft started and completed into the solid rock by first driving sheet piling—piles consisting of 3-inch plank and provided with tongue and groove or dovetailed joints. These fit closely and when driven to bedrock will, in all probability, render the structure water tight, when the excavation may proceed, the water being pumped or hauled out. The freezing method is also applicable to this condition, but the former method is cheaper and more quickly available, as the sheet piling can be made by carpenters on the ground, and a pile driver could be improvised to drive the piling. If the loam and sand are too deep for one line of piles a second line may be driven inside the first, when the excavation has proceeded far enough to justify this course.

THE amount of solution to be precipitated in cyanide works per ton of ore treated varies from  $\frac{1}{4}$  ton in works of large capacity (600 tons daily) to 1 ton or over in small plants, treating 100 tons or less per day. It is the practice to pass about 26 cubic feet of solution per hour through precipitation boxes 20 to 24 feet in length, 26 inches deep and 36 inches wide. A means of calculation is based on the above amount of flow as follows: For each ton of solution (32 cubic feet) to be precipitated per hour, 21 cubic feet are to be provided in the zinc box, and each compartment of the series is to be designed to hold 1 cubic inch of zinc for every ton of solution treated monthly. A plant treating about 30,000 tons of solution monthly should have precipitation boxes each holding 30,000 cubic inches of zinc shavings or, say, 24 inches deep, 36 inches square on the bottom.

WULFENITE is molybdate of lead—a mineral not uncommon in lead producing mines of the Western States, particularly those of Arizona, New Mexico, Nevada, Utah and southern California. It is also found in Mexico. It often occurs in groups and masses of brilliant amber, yellow to reddish crystals, of great beauty. Sometimes the mineral is dull and earthy looking. The ore contains molybdenum trioxide 39.3%, lead oxide 60.7%. Large amounts of this mineral have been sent together with other lead ores, to the smelters, from Castle Dome in Arizona near the Colorado river, and from other Arizona mines. As far as known to "Concentrates," wulfenite has never been used as a source of molybdenum. Unless the ore exists in the form of handsome cabinet specimens, it is probably not worth more than the value of the lead it contains; its commercial value must be determined consequently in the same manner as other ores of lead.

THE "reefs" of the Witwatersrand are beds of conglomerate or puddingstone intercalated in sandstones and quartzites, and are in no sense to be regarded as veins, though worked in a similar manner to veins. The origin of the gold, which is said to be wholly in the cementing material, is not unlike that of gold in veins—that is, it has been carried into the open spaces in the conglomerate in solution and there deposited when proper conditions were found. There are numerous dikes of diabase cutting these conglomerate beds, and they are often found disturbed by faulting. It is probable, however, that the gold was introduced prior to the faulting, and that the dikes have in some manner influenced the deposition of the gold. There are large

numbers of these reefs of varying thickness, but comparatively few carry gold, and of these only a small number are payable. The deepest shafts and bore holes have intersected the reefs nearly 8000 feet from the outcrop.

IN surveying the mine the surveyor should establish marks which shall be permanent. Marks on timbers (nails driven in at stated places) are too easily moved to make them altogether reliable. One of the best methods of fixing points in underground surveys is by drilling a short hole at the point, inserting a wooden plug and driving a slender nail at the exact spot determined by the cross hairs of the transit. In shaft work it is often inconvenient to do this, and in such cases points on timbers are used, but in the case of important underground connections, where large expenditures are involved, it is best to resurvey the workings from the surface where these points have not been fixed in immovable rocks, for timbers often shift and may throw a line out sufficiently to cause a great deal of trouble in making distant connections. The transit points at the collar of the shaft should be determined by the bearing of distant fixed objects and not depend upon anything in the immediate vicinity of the shaft, as the ground often settles about the shaft sufficiently to cause serious errors in the survey.

THE principal ores of nickel are genthito, a nickel silicate, color pale apple green or yellowish. It has a resinous luster; garnierite, also a silicate, consisting chiefly of hydrated silicate of magnesium and nickel, color bright apple green, pale green to nearly white. It has a dull luster, is sometimes greasy to the touch, and some varieties adhere to the tongue; niccolite, or copper-nickel, also containing a little cobalt and arsenic, being a nickel arsenide, usually massive and impalpable (without visible grain), luster metallic, color pale copper red, streak pale brownish black. Pyrrhotite—the magnetic sulphide of iron—often contains nickel and cobalt, is usually associated with nickel ores. The presence of nickel, cobalt, manganese and zinc in an ore can generally be detected from each other in an ore by adding to the acetate solution first ammonium chloride, then excess of ammonia, and finally an excess of potassium ferro-cyanide, when one of the following reactions will take place: A brown precipitate indicates manganese; a deep red solution, cobalt; no change in the cold, but on boiling a copper-red precipitate, nickel; no change in either hot or cold liquid. Add potassium ferro-cyanide, white precipitate, zinc.

THE story of the "Pegleg" Smith mine so commonly repeated has never been substantiated by any fact. It was first published in the latter 50's in a Los Angeles, Cal., paper, and has been repeated with variations for nearly fifty years, until it has come to be looked upon as a reality. It was supposed to be located somewhere between Fort Yuma and Warner's Pass and east of the Cuyamaca range, in San Diego Co., Cal. Hundreds of men have searched the desert in that region, near the old Butterfield trail, but without success, and many have lost their lives pursuing this ignis fatuus. There is little "sign" of mineral in that portion of the desert, and prospectors who contemplate a trip into that section would better confine their search to the territory between the Southern Pacific railroad and the Colorado river, where mineral veins are more or less abundant. As far as known, the United States Geological Survey has not yet issued a map of the Death Valley region, although the California State Mining Bureau has published maps of San Bernardino county and Bulletin 24 of the Mining Bureau, "The Saline Deposits of California," which contains maps and much information of the desert region of California.

IT would be difficult to arbitrarily state the amount of water required in a 5-stamp battery of ordinary type, without some knowledge of the character of the ore to be treated. It is customary to calculate upon providing at least 1000 gallons of water for each ton of ore crushed, although this amount may not be required. The quantity used is sometimes influenced by the amount of water available, and at many mills a scarcity of water necessitates pumping back a portion of that used, from settling reservoirs, for reuse. Many estimate the quantity of water per stamp for a stated period, but this seems an improper basis for such calculation, as in two mills equipped with the same weight stamps, etc., the tonnage crushed per stamp may vary greatly, due to the difference in the ore. In one, a stamp may crush 2.5 tons in twenty-four hours, and in the other 5 tons may be crushed. If the same amount of water is to be employed per stamp, it is obvious that in one mill twice as much water will be used per ton crushed as in the other. The tonnage treated is therefore the proper basis of calculation. Some ores require much more water than others, and often the subsequent treatment (concentration or cyaniding), has an important influence on the quantity of water that may be used. It is a common practice to add water to the pulp after it leaves the batteries, when concentration follows amalgamation, and still more water is added on the concentrating machines. Briefly, it may be said that the quantity of water used varies greatly—from 2.5 tons per each ton treated to as high as 16 tons. A small amount of water in the battery favors amalgamation but promotes sliming, while a large amount reduces sliming but permits only imperfect amalgamation, except on the most free milling of ores. The proper amount to be used should be determined by experiment.



## Mica; Occurrence and Uses.

Written for the MINING AND SCIENTIFIC PRESS.

The present demands of the electrical trade for mica and the working of the Barton mica mines in Piru and Lockwood creeks in Ventura county, California, suggest the timeliness of a description of the occurrence and mining of mica. India, Canada and the United States are the principal producers, and in addition considerable is obtained from Brazil.

India annually produces 1000 tons of mica, chiefly from Bengal and Madras. There are seventy mines being worked in the districts of Nellore, Nilgris and North Arcot, in Madras, employing about 3000 persons, including women. The sixty mines of Hazaribagh, Bengal, employ over 6000 persons. The government annually leases the land to the highest bidder.

The method of mining used by the natives is exceedingly primitive. Prospecting is done during the rains and all finds marked to be mined during the hot and cold season. Shafts 3 or 4 feet in diameter and about 40 feet deep are sunk every few feet along the deposit, first inclining a few feet to the left and then to the right, making a zigzag series of steps from top to bottom. Baskets of mica and refuse are hauled up these pits, usually by women seated on ladders or on a framework at the mouth of the pit, where it is hand-sorted and graded. Water is taken out in jugs passed from person to person on the ladders.

The blocks of mica raised from the mine are cleaned of quartz and feldspar in the stripping room, and

composition product, are often mined for pottery purposes. The mica books are usually irregularly distributed, being sometimes near the hanging or foot wall, often near the center, either clustered into bunches, or many feet apart.

There is a great difference in the quality of mica

off the cracked and stained mica. The free-splitting mica is trimmed and assorted, No. 1 being 4x6 inches, 6x8 inches, and larger; No. 2 from 3x4 inches to 4x6 inches; No. 3 from 2x4 inches to 3x4 inches, and No. 4 from 1x1 inch to 2x4 inches. The waste and trimmings are ground as scrap mica. C. F. Rice



Working of Newfound Mica M. Co., New Hampshire.



Crown Mica Mine, Custer, S. D.

when split the sheets are scribed and afterwards cut with a pair of shears along the scribing.

The mica occurs in small plates in many of the crystalline and metamorphic rocks of India, but the large crystals of commercial value occur with feldspar and quartz forming a coarse-grained pegmatite frequently intruded into older granites or into metamorphic rocks.

In Canada the phlogopite and biotite varieties are mined in the provinces of Ontario and Quebec, in the district about Ottawa, while transparent mica occurs at Tete Juane Cache and Canoe river in northern British Columbia. In Ontario there are mills at Sydenham, Ottawa, Kingston and Perth, which split the blocks of mica and thumb-trim it. Fortin & Gravel have a mine and mill at Hull; the Allan Gold Reef have a mine in Denny, the Glen Almond Co., in Portland East; the Vavassour in Hull, and F. N. Webster at the Cascades in Gatineau.

According to H. K. Scott in a paper read before the Institution of Mining and Metallurgy, mica occurs in workable quantities in the States of Goyaz, Bahia and Minas Geraes in Brazil. Near Santa Luzia de Carangola in Minas Geraes, the mica is found in pegmatite veins, lenses or dikes, in metamorphic schists, being generally altered to kaolin. The Fonseca and Coronel mines have been worked regularly, producing over fifty tons.

In the United States mica has been found and mined in most of the Appalachian States and many western regions where the country rock is mica schist intruded by pegmatite dikes. Its commercial sizes are found in about one-third of the States and Territories, but the chief producers are North Carolina, New Hampshire, South Dakota, New Mexico, Idaho, Virginia, Colorado and California. The United States Geological Survey, particularly in the twentieth annual report, has published much regarding the occurrence of mica. It is found usually as muscovite constituting about 10% of pegmatitic dikes in granites, gneisses, and micaceous and hornblende schists. These dikes are made up of quartz and feldspar in nearly equal proportions, the quartz being usually massive, although sometimes semi-crystallized and the feldspar being coarsely crystallized, the individual crystals occasionally weighing 1000 pounds or more. Muscovite mica is found generally disseminated throughout the quartz and feldspar in small scales and crystals and in large irregular crystalline blocks or "books" from a few inches to several feet in size. The feldspar and kaolin, its de-

scribed the work of the Newfoundland Mica M. Co. at Alexandria, Grafton county, in the MINING AND SCIENTIFIC PRESS of Feb. 23, 1901.

The mica in the Black Hills of South Dakota is usually good in color and free from iron specks, although sometimes the books are ruled and wedge shaped, making the sheets smaller and the splitting defective. The Crown mica mine, near Custer City,

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Natives Trimming Mica at Behar, India.

found in Mitchell, Yancey, Jackson, Haywood and Macon counties, occurring in pegmatite dikes, of which 1% to 10% is mica. New Hampshire's chief mines are at Alstead, Cheshire county, also in Grafton and Sullivan counties. After the mica has been blasted out it is "rifted" or dressed by hand to split

was described in the MINING AND SCIENTIFIC PRESS of March 21, 1903, by D. Hennault. The Black Hills Porcelain, Clay & Marble Co. has done considerable work in Custer county. Custer and Pennington counties offer considerable opportunity for prospecting. The Etta mine, near Keystone, has been rather



closely studied by geologists. It was first worked for mica and afterwards for tin. The outcrop of the dike rises as a low rounded hill and is indistinctly concentric in structure. Dark-colored small scales of mica alternate with large blocks of muscovite in the matrix nearer the country rock, and next this is a coarsely semi-crystallized feldspar, in which is imbedded enormous crystals of spodumene, 30 feet or more in length. Toward the center of the dike the feldspar is less coarsely crystalline, and occurs with numerous smaller blocks of mica and quartz to form a greisen mass, in which most of the cassiterite is imbedded.

In New Mexico workable mica has been found in eastern Rio Arriba county and in San Miguel county, northwest of Las Vegas. The mica is good, but often badly "ruled," i. e., the sheets are cut partially or entirely through along lines parallel to the crystal faces. It often renders 75% of the mica valueless except for scrap. Considerable work has been done in the Cribhensville district.

The center of Idaho's mica industry is east of Moscow, in the Roberson mining district. The principal producers have been the Muscovite, Last Chance and Luella mines.

Amelia county is Virginia's chief source, although considerable has been done in Amherst, Bedford and Hanover counties. Much of Colorado's mica is "ruled." Deposits have been found near Floyd's station, 5 miles east of Idaho Springs; at the Terrell mine, 18 miles northwest of Golden; the Scheller mine in the same region; the Beers mine, 3 miles south of Idaho Springs; the Mi-Wot mine, northwest of Boulder; the Pearl mine, south of Leadville, and the Snively and High Creek mines, near Cripple Creek.

In California commercial mica has been reported from several places, one of the most important of which is on Piru creek in Ventura county, 53 miles

strike large blocks of mica in the first day's operations. Some of the larger mines are now being operated with more modern methods, including air drills, steam hoists and pumps. Dynamite is used in blasting, as it injures the adjacent mica less than did the powder formerly used.

The blocks as they are brought from the mine are sent to the storage or stripping room, where all foreign matter is removed from them. In describing further handling, J. A. Holmes says that by means of wedges and heavy knives these blocks are then split into sheets of varying thickness, which in turn are roughly trimmed and classified. These sheets are turned over to the scribes, where they are again split with knives and cut into the largest possible sizes. The cutters are supplied with patterns representing the different sizes and shapes in demand, and trim the sheets to these patterns with shears. Machines are also used. As the mica is cut it is graded and the different grades wrapped together in strong paper, in packages of one or more pounds.

But 90% of the mica taken from the mine is used as scrap mica. The ingenuity and skill in its utilization make an interesting study, which the writer was permitted to undertake through the courtesy of the Mt. Alamo Co. Many of the more perfect scraps and small sheets produced are cemented into larger sheets, being built up in a form to the desired thickness, with shellac as a cement. These "boards" are then rolled and subjected to a pressure of 2000 pounds to the square inch, and then kiln dried. These are afterwards molded, and are stamped into various shapes necessary for commutator segments, gaskets, etc. The machine for making electrical conduit first rolls asbestos paper on a rod, which is then covered with cotton cloth rolled in the opposite direction. This is passed through tar, covered with

pressure of the overlying schist were of any particular value. There are great variations in mica deposits. Most mica veins contain only small pockets of mica, which are soon worked out. The most economical way of mining mica is by steam or compressed air drills. It was thought until recently that mica could only be mined by hand drills, on account of the danger of breaking the crystals, but I have found by practical test that in drilling deep holes there is less liability of their destruction than with the shallow holes drilled by hand. The handling of the mica is very important in mica mining, as the value of the mica depends upon the size of the crystals, and an increase of the size (1 inch) makes a difference of \$1 a pound in the market value. If 10% of all the mica mined would cut into squares 2x2 inches and larger, up to 4x6 inches, it would be considered a good paying mine—the 10% being considered plate mica and the balance scrap mica. Plate mica is used as an insulation in all electrical machinery, such as dynamos, motors, transformers, etc. The scrap mica is ground into different grades and is used in insulating compositions in combination with binding material, also in the manufacture of wall paper pulp for decorative purposes; in paint, lubricating oils, and grease, fireproof material and in the adulteration of rubber.

### Magnetite as a Flux.

TO THE EDITOR:—Can you give any reason why magnetic oxide of iron cannot be used as flux in smelting? Or, if it can be, how? At the smelter at Ketchum, Idaho, are several carloads, sent there in the 80's for flux from Montana, which could not be used. At Mineral and at Cuprum, Idaho, the same class of ore was tried for fluxing, all with the same result, that the crucible would fill up with a



Tunnel of Mt. Alamo M. Co., Near Bakersfield, Cal.



Shop of Newfound Mica M. Co., New Hampshire.

from Bakersfield and from Lancaster, the shipping point. This is being extensively worked by the Mount Alamo Mining Co., with offices at 36 Geary street, San Francisco, Cal. The mica occurs in a large pegmatitic dike with a mica schist hanging and a granite foot wall. Mining has been conducted to a depth of 200 feet. So far the dike has been somewhat broken and faulted, but following the analogy of other mines it is hoped to get plate mica 2 or 3 feet square with increase of depth. The pegmatite dikes outcrop prominently, varying in width from a few feet to several hundred feet. The percentage of mica, as in the case of all such dikes, is variable with respect to quantity and in the percentage of plate mica in the individual blocks. Crystals of clean, clear mica are obtained that cut sheets from 2x3 inches to 4x10 inches, but the greater part of the mica is shipped as scrap to the company's factory in West Berkeley, Cal., where it is manufactured into mica segments, washers, tubes, troughs, mica conduits for electric wires, etc. They also grind mica and make mica pulp for wall paper.

The mining and preparation of mica for the market requires considerable skill and judgment gained only by experience. The mining operations in the United States are usually somewhat crude, being generally conducted on a small scale. The prospector upon finding a fair prospect for mica on the surface of a dike usually "follows the mica" as long as it is in sight, working entirely by hand with a couple of partners. Upon losing sight of the mica he tries in different directions until he strikes another lead, thus opening the mine in an exceedingly irregular manner known as "ground hogging." The irregular distribution of the mica so adds to the difficulty and uncertainty that the prospector frequently becomes discouraged and discontinues operations, while a second party starting the work anew will

ground mica, and then goes to the knitting machine, which surrounds it with a covering of knitted string. The whole is soaked in tar and mica and dried.

The most important product is ground mica. A. J. Hoskins, the superintendent for the Mt. Alamo Co., has devised an efficient grinder for this purpose, which may now be used for general grinding. It consists essentially of four revolving grizzlies moving within 1/2 inch of a corrugated iron surface covering the whole. The mica or other material is broken by centrifugal force. When broken it is carried out by an air blast and conveyed to trommels for sizing. The mica is ground from 6 to 100 mesh, 28 being used the most. This crusher should do much for the mica industry, as in the past this grinding has been difficult.

A. J. Hoskins, superintendent of the Mount Alamo M. Co., has sent the following communication on this subject to the MINING AND SCIENTIFIC PRESS:

To the advancement of electrical science is due the ever increasing demand for mica as an insulator. The mica of commerce is a silicate of aluminum and one of the important constituents of nearly all the granite formations. A mica vein is in reality a granite vein, of which mica is only a part. The difference between what is known as a mica vein and an ordinary granite vein is that in the mica vein each constituent is larger in proportion. In the mica vein, where the mica is large, the feldspar, quartz and tourmaline are also large proportionally. A mica vein is formed between schistose, or sedimentary rock, which acts as a hanging wall or foot wall. Mica usually crystallizes against the hanging wall, and generally within 3 feet of contact. The appearance of the hanging wall is an index of the value of the deposit—as I have found by examination of 150 deposits that only those deposits indicating extreme

past mass of magnetic oxide of iron, starting on the bottom and gradually working up, apparently melted, but not combined with anything else. On harring out the mass would appear like the ore before going into the furnace. It was not solid like a "sow," but could be easily broken with a hammer. I saw once in some paper that magnetic iron ore was being sent to some of the northwestern furnaces for flux, but could never learn how it was used.

Landing, Or., Jan. 28.

E. ANTZ.

As far as known, magnetite is not successfully employed as a flux in any of the blast furnaces of the United States in the reduction of copper or other ores. It has been stated that magnetite is used as a flux at Clifton, Arizona, in the copper furnaces of the Arizona Copper Co., but this is not the fact. In addition to the ore, matte and slag are employed in the charge, and no magnetite is used in the charge, or, if so, it is merely incidental, and in very small amount. The subject is an interesting one, and if magnetite is being successfully employed as a flux in the reduction of copper ores at any place, the MINING AND SCIENTIFIC PRESS will be pleased to learn of it, together with details as to furnace charges and results.—ED.

### Frothing in Zinc Boxes.

TO THE EDITOR:—"Concentrates" states that foaming in the zinc boxes is caused by an excess of lime or other alkali. In our experience foaming in the boxes ceased on the addition of more lime to the leaching vats. The excess of lime, however, caused



a greater consumption of zinc and an increase in the amount of white precipitate in the boxes.  
Cripple Creek, Colo., Jan. 25. F. F. REINER.

Without doubt the foaming of zinc boxes is due to various causes. F. L. Bosqui is of the opinion that foaming is chiefly due to the presence of organic matter in the material being treated—not an unusual thing in tailings. In such case the rootlets and other foreign organic matter should be screened and washed out as thoroughly as possible before treatment with solution begins.—Ed.

## Methods of Renewing Old Timbering at the Dives-Pelican Mine, Silver Plume, Colo.

NUMBER III.—CONCLUDED.

Written by J. F. McCLELLAND.

**CHUTES FOR DRAWING ORE FROM OLD STOPES**—The old mill holes in the mine stopes have caved in and are useless. For drawing the ore, chutes have been erected at intervals of about 25 feet along the drifts. These are peculiar in that they are put in after the regular drift timbering has been completed. The

a longitudinal section through a raise which was put up through an old stope to re-establish communication with some abandoned workings. The broken ore at this point was well packed in the stope and would not run in very large amounts. When the raise had been carried up about 50 feet a solid rock pillar was unexpectedly encountered, necessitating the change in direction shown in Fig. 19. The distance between the foot and hanging walls varied from 2 to 4 feet, and the walls themselves were fairly strong.

The timbering consists of three rows of short stulls (called spreaders) about 4 feet apart and set in hitches, as shown in Fig. 21. These divide the raise into two compartments, one of which is used for a manway and the other for an ore chute. Two-inch plank are spiked to the middle row of spreaders to form a tight partition between the compartments. Plank is also used for lagging the outside spreaders (Fig. 20).

Only one-half of the face of the raise is advanced at one time. The last spreaders on the other side are covered with planks, thus forming a roof, under the protection of which a man can stand and work. Most of the actual excavation is done with a bar, the loose material falling into the chute below. When the face has been advanced about 2 feet a couple of temporary spreaders (a, Fig. 20) are put in and cov-

co-operation of his partners or the men he employs to make his profit. He can rarely afford to add greatly to what appears to be a normal price for the work to cover changes in conditions which may occur.

## The Mines of Cripple Creek, Colo.\*

NUMBER III.

Written by W. LINDGREN and F. L. RANSOME.

**REPLACEMENT DEPOSITS IN GRANITE.**—The replacement deposits in granite all occur in close proximity to the contact with the breccia, and are well developed in the Elkton (Thompson), Ajax, Independence and Portland mines. Although these bodies of ore are related to fissures and occur particularly where several fissures intersect, or where they meet a dike, the ore is not confined to the actual fractures. The rock in the vicinity of these fissures is often extensively altered. The change from altered to unaltered rock, while never perfectly sharp, is often fairly abrupt and may take place within a distance of a few feet. The most obvious characteristic of the metamorphosed rock is a porous texture and a change of the reddish color of the normal granite to grayish or greenish tints. Closer examination shows that, while the porphyritic aggregates of pink microcline, so prominent in the Pikes Peak type of granite, may remain unaltered, the rest of the rock, consisting originally of microcline, oligoclase, quartz and biotite, may be completely recrystallized as a porous, vuggy aggregate of secondary orthoclase (valencianite), quartz, fluorite, pyrite, calaverite or sylvanite, and, in exceptional cases, sphalerite and galena. The ore minerals are partly inclosed in the other secondary minerals, but occur most abundantly with little projecting crystals of fluorite, quartz and valencianite on the walls of the irregular pores so characteristic of the altered rock. The biotite of the original granite yields most readily to alteration, and, in rock otherwise almost entirely unaltered, may be changed to an aggregate of fluorite, quartz and ore minerals. Some of the ore of the Ajax mine exhibits well this initial stage of alteration. With further alteration the original quartz and oligoclase of the granite are attacked. The quartz, originally in large homogeneous and irregular grains, recrystallizes as aggregates. Secondary orthoclase or valencianite forms often in clear, sharply idiomorphic crystals, which either project into open cavities or form aggregates with the secondary quartz. In many cases, however, the secondary valencianite results from the recrystallization of the older microcline practically in place. The two generations are sometimes distinguishable by the greater clearness and more or less idiomorphic form of the younger mineral and the absence of the characteristic microcline twinning. But it is often impossible to determine the line between feldspar which, from its association with quartz and fluorite, is clearly secondary and the original microcline of the granite. Occasionally a little calcite may be detected in the altered granite, but this is rare. The original apatite and zircon of the granite are not, so far as observed, affected by the alteration described.

While the replacement deposits in granite are important because of their size and the readiness with which the ore may be mined free from waste, the ore itself is usually of lower grade than that formed in the fissures of the sheeted zones.

**MINERALIZED "BASALT" DIKES.**—The ore bodies formed by the mineralization of basic dikes are in some ways closely related to the sheeted zones already described. Like the phonolite dikes, the "basalt" exhibits a pronounced tendency to split into thin sheets parallel with the dike walls. Normally, the minute fissures so formed are filled with veinlets of calcite and contain no ore. When, however, a zone of fissuring coincides with the dike the latter may be traversed by veinlets of quartz and fluorite carrying sylvanite or calaverite, while the body of the dike may be impregnated with pyrite. Such ore differs from that of the usual sheeted zones in breccia or phonolite in that the tellurides are not so clearly confined to the actual fissures, but appear to some extent to permeate the rock with the pyrite. The richest portion of the ore, however, undoubtedly occurs in the small veinlets in the dike, and usually near one or both walls where the fissuring is best developed. The occurrence of rich ore bodies in basic dikes in the Portland (Anna Lee), Moose, Elkton, Conundrum, Pinto and other mines has tended to exaggerate the importance of these dikes in general, and some have even supposed a genetic relation to exist between them and the mineralization of the district. Such an hypothesis, however, loses sight of the vast amount of profitless work that has been expended in the district in driving on the usually unproductive basaltic dikes, and the very small proportion of the known ore bodies that can be shown to have any connection whatever with these intrusions. That the basaltic dikes are not always readily mineralized even when accompanied by fissuring is shown in the interesting case of the Strong mine, where the ore occurs as mineralized granite on each side of the dike, while the latter is barren.

**DEPTH OF OXIDIZED ZONE.**—At a few points, as in

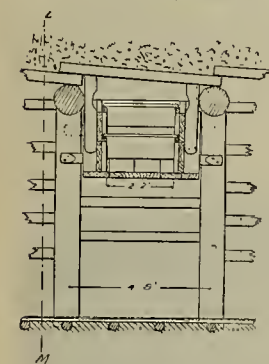


FIG. 16.

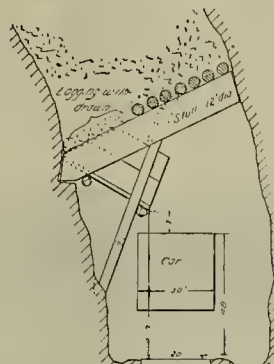


FIG. 17.

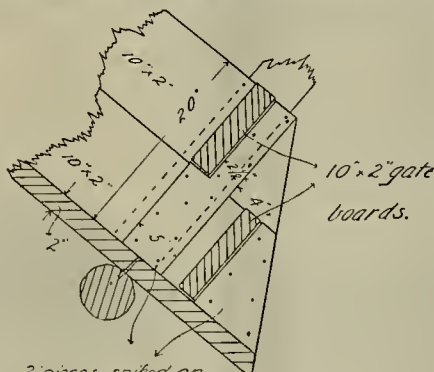


FIG. 18.

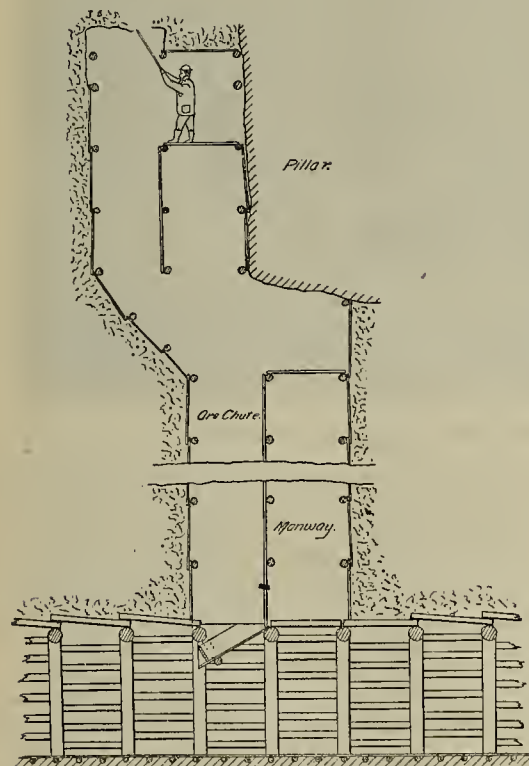


FIG. 19.

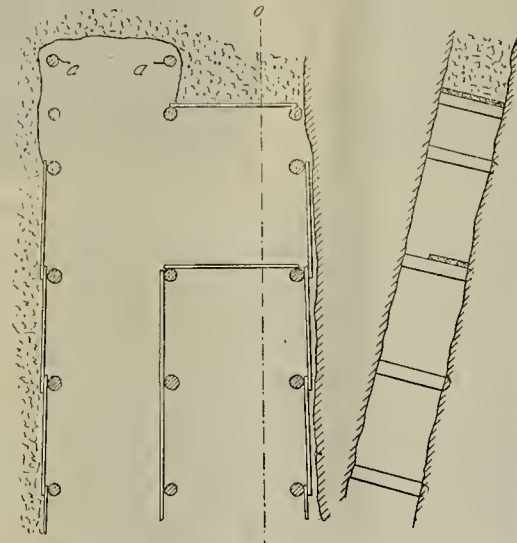


FIG. 20.

FIG. 21.

chutes are built between the sets, as shown in Figs. 15 and 16. When completed, three or four lagging poles directly overhead are either withdrawn or cut away.

The details of construction vary in different cases. Figs. 1 and 16 show a chute built under three-quarter sets, and Fig. 17 shows the form used with stull timbering. The gate is represented in section in Fig. 18. It is convenient and easily operated. The use of two gate boards gives good control over the passage of the ore and allows large rocks to be easily extracted. In order to facilitate the raising of the gate boards the front of the chute is made about 1 inch wider at the top than at the bottom (Fig. 16). Many of the chutes were erected and used to obtain large samples of the ore in the old stopes, while the property was being sampled.

**RAISING THROUGH AN OLD STOPE.**—Fig. 19 shows

ered with plank. The miner then stands under these and bars down the face on the other side of the raise. The permanent spreaders are put in when the raise has advanced far enough, and the lagging and partition are kept up as near as possible to the face.

This work is dangerous and requires a high degree of skill on the part of the miner. The ore in the chute was kept as low as possible, so that in case of a sudden cave of a large amount of material the chute would not fill up entirely and imprison the men.

In bidding on mining work by contract the miner usually bases his estimate on the appearance of the ground, and decides from experience about how much he can afford to do the work for and earn good day's wages. He makes a bid accordingly—adding to his estimate according to his knowledge of the men who are his competitors in bidding, but he relies largely upon hard work, full time, and the earnest

\*Abstract School of Mines Quarterly.

\*Abstract Bull. 254, U. S. G. S.



the Abe Lincoln and El Paso mines, tellurides are found almost at the surface. It is much more common, however, to find an upper zone, from 200 to 400 feet deep, in which free gold prevails and which gradually changes to the zone of pure telluride ores. As may be expected from the varying surface form and conditions of drainage, there is great range in the depth attained by oxidation. Partial oxidation extends in many mines to a depth of 1000 feet, especially along the often more or less open fissures. In the Wild Horse mine the zone of complete oxidation reaches a depth of 1100 feet and then suddenly ends. In the Isabella mine partial oxidation attained at least 1200 feet, and the same applies to the Gold Coin mine in Victor, although telluride ores prevail at that depth as well as in many levels above. The question is chiefly one of depth of ground water and of facilities for circulation of oxygen.

**RELATIONS OF ORE BODIES TO DEPTH.**—It is well known that the payable ores in auriferous lodes are rarely equally distributed in the lode, but form tabular bodies of more or less regular outline. The projections of these ore bodies on the plane of the lode often appear as elongated areas with greater vertical than horizontal extent. The ore bodies or shoots of Cripple Creek show great similarity to those of other gold-bearing veins; their limit in depth is usually as well defined as their extent in a horizontal direction.

Of sixty pay shoots of Cripple Creek mines plotted together for purposes of comparison, over thirty extended from the surface to a depth of less than 500 feet. The maximum individual production of these is less than \$1,000,000. Near six of these ore bodies further exploration developed new shoots below the old ones, but usually of smaller extent. In practically all thirty cases the development work had been carried down a few hundred feet below the best ore of the surface shoot. The form of these smaller shoots is often equidimensional; in a few cases the horizontal extent is greater than the vertical, or the shoot is wholly irregular; in many cases the shoot pitches steeply northward on the plane of the vein and the ratio of vertical to horizontal extent is 2:1 or 3:1.

In eight of the sixty cases the shoot extended from the surface to a depth of 1000 feet, or a little more, and ended. Further development to about 1500 feet failed to find new shoots of any importance, though small pockets are often discovered. In six of these eight cases the ratio of vertical to horizontal extent varies from 3:1 to 5:1, and the shoots usually pitch northward at angles of 60° to nearly 90° from the horizontal. In the remaining two cases the shoots have about the same horizontal as vertical extent. The maximum horizontal length is 1300 feet, while 400 is much more common. In two of the sixty cases the pay shoot is 1500 to 2000 feet long, maximum depths of 600 and 1000 feet having been attained and the bottom level being still in ore. In thirteen of the sixty cases the shoot began over 200 feet below the surface; in eight of these the bottom of the shoot has been reached, while in five the lowest level is still in ore. Steeply dipping, irregular elongated forms prevail. Many of this group of thirteen represent veins parallel and close to those on which pay shoots outcropping at the surface were found.

These statements will give an idea of the form of the shoots. Of course, in the case of shoots reaching the surface, a certain part has probably been removed by erosion. Judging from the shoots which distinctly began below the surface, the normal form of the ore bodies is elongated, vertical, or pitching sharply northward, the ratio of vertical to horizontal extension varying from 1½:1 to 5:1. Some of these shoots are, however, of about equal dimensions, vertically and horizontally, while in a few the horizontal dimensions are the greater.

Of the known ore bodies, as few exceed 1000 feet in length, so very few exceed 1000 feet in depth or extend more than 1000 feet from the surface. Speaking broadly, explorations below that limit have not proved very satisfactory. Drawing the lines a little closer, it may be said that in proportion to the amount of exploration the upper 700 or 800 feet have yielded more than the interval from that limit to the lowest levels reached—about 1500 feet. It must not be overlooked, however, that four or five mines still have good ore bodies at a depth of 1200 to 1400 feet from the surface. The developments of the next year or two will probably give a safer basis for generalization.

Roughly speaking, the above mentioned distribution holds good for any elevation within the district. In other words, the principal productive zone everywhere occupies the space from the surface down to about 1000 feet below it, and its lower limit thus forms a curved surface approximately parallel to the surface of the ground.

It is probable that the minimum depth of rock removed from the district by erosion amounts to 1000 feet in the central part and to 400 or 500 feet about the periphery. The shape and number of the ore bodies formerly existing in this eroded zone can be only conjectured. It is probable that the veins were formed shortly after the close of igneous activity, while the volcano yet possessed a much greater height than at present. The absence of hot waters and the depth of oxidation attained indicate that

vein formation at Cripple Creek is by no means a recent phenomenon.

The general features of the vertical distribution of the known ore bodies recorded above have of late years received more or less recognition, and there has been a decided tendency to attribute them to a process of secondary enrichment effected by waters moving generally downward from the surface. It has been supposed that such waters have carried down a part of the auriferous contents of those portions of the lodes now removed by erosion and have enriched originally lean pyritic ores by the secondary deposition of gold and silver tellurides and argentiferous tetrahedrite, with associated gangue minerals.

It is clear that the hypothesis in question is suggested by the distribution of known pay shoots. The question arises, How far does the distribution of known pay shoots represent the distribution of all the pay shoots in the district? In other words, How far has exploration been impartial in revealing ore bodies near the surface and at depths greater than 1000 feet?

It requires but little examination to make clear the fact that ore bodies within 1000 feet of the surface are far more likely to be discovered than those at greater depth. While shafts have been sunk for a few hundred feet without any indication of ore and have ultimately been developed into productive mines, such a procedure is considered bold prospecting, and few well-informed mining men would seriously contemplate sinking a shaft over 1000 feet in depth solely on the expectation of finding possible ore bodies below that depth. Most of the large mines in the district have started upon some indication of ore near the surface and have grown by the subsequent discovery of other lodes and ore bodies in the course of their underground development. As few individual ore bodies persist for more than 1000 feet in depth, by far the greater part of underground prospecting is at less depths, there being usually little inducement to go deeper, unless, as in the case of the Gold Coin and Portland mines, lodes are discovered in which the ore, beginning several hundred feet below the surface, extends deeper than the pay shoot upon which the mine was originally opened. Thus deep prospecting is usually confined to the vicinity of the larger and more persistent pay shoots which have been followed down from near the surface. Underground water has also proved a most serious obstacle to deep prospecting, few properties being able to develop below the 1000-foot zone unless there is abundant and high-grade ore in sight.

It may thus be concluded, without necessarily advocating promiscuous exploration below the 1000-foot zone, that any ore bodies existing below that depth are far less likely to be discovered than those above, where from the surface to depths of several hundred feet the rocks of the district are riddled with shafts, drifts, crosscuts and adits. It is exceedingly difficult, however, to determine, even approximately, the relative importance of this factor in this problem. It is probably safe to assume that the chances of discovering a given ore body within the 1000-foot zone are at least ten times those of discovering an ore

body in the Cripple Creek district has led to the conclusion that the fissures, which ordinarily are narrow and often appear as mere cracks, do become less abundant and less conspicuous at greater depth is attained. No mine exhibits this feature better than the Stratton's Independence, in which the very complex systems of productive fissures on the fifth and higher levels contrast more strikingly with the few, insignificant, and unproductive fractures visible on the fourteenth level. In less degree the same feature is shown in many other of the deep mines, but the rule is not without some very marked exceptions.

The dependence of the ore zone on the surface would then merely express the depth to which fissuring extended in a conical volcanic mountain.

We have thus two factors of importance to account for the scarcity of ore shoots below the 1000-foot level—first, difficulties of development and exploration, and second, the disappearance of fissures in depth. They do not seem to be sufficient, however, and it is believed that a third factor, as yet undiscovered, exists, and that it is related to the chemistry of the actual ore deposition.

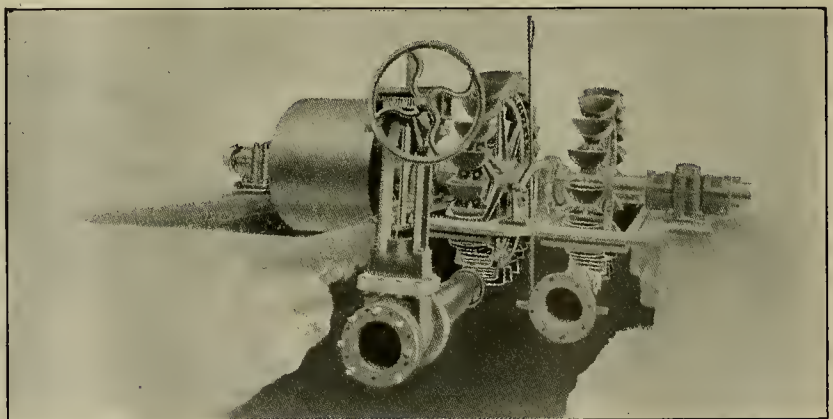
In those districts where so-called secondary sulphide enrichment is known to have taken place, the ore minerals exhibit in general an orderly sequence, both in relative abundance and in kind, from those characteristic of the most highly enriched ore near the zone of oxidation to those constituting the original, lean and unaltered ore. The secondary minerals produced are such as can result from rearrangement and concentration of elements present in different combinations in the primary ores. At certain points within this range of alteration it is possible to detect direct mineralogical evidence of the change of one mineral to another, effected by solutions moving downward from the zone of oxidation. In most cases the secondarily enriched ores bear a recognizable relation to the lower limit of oxidation.

Careful study of the Cripple Creek ore deposits has failed to discover that the hypothesis of secondary enrichment is supported by crucial evidence of the kind just indicated. The minerals are not arranged in any discoverable definite sequence, nor does the present investigation find so much to support the view that the rich telluride ores, as a rule, pass with increasing depth into low-grade pyritic ores. Frequently such ore as occurs below a depth of 1000 feet is precisely the same in character as ore found within 100 feet of the surface. Tetrahedrite, which has been regarded by some (without definite proof) as a secondary mineral, occurs sporadically throughout the district and at all depths reached by present workings. The richest ore does not uniformly occur immediately below the oxidized ore.

(TO BE CONTINUED.)

### Unique Water Wheel Connection.

The Hercules M. Co., Harry Day manager, at Burke, Idaho, has installed water wheels to be used in connection with their mining operations in the



Unique Water Wheel Connection.

body below that zone, and the ratio may be very much greater. It is probably true that there was originally more ore within the 1000-foot zone than there is in a corresponding zone below, but this disparity is not necessarily anything like so great as is indicated by the vertical distribution of known pay shoots.

Another important line of inquiry bearing upon the relations of ore bodies to depth is concerned with the question of the relative size and abundance of the fissures near the surface and at greater depth. It has been shown that all the ore bodies are intimately connected with fissures. If such fissures are generally smaller and less abundant below the 1000-foot zone than they are within it, obviously there is introduced a factor which diminishes the supposed importance of secondary enrichment by affording an anterior and physical explanation for the decrease of ore with increase of depth.

Detailed examination of practically all the access-

to the Hercules M. Co., Harry Day manager, at Burke, Idaho, has installed water wheels to be used in connection with their mining operations in the



### Gold Mining in Rhodesia.\*

Written for the MINING AND SCIENTIFIC PRESS by F. C. ROBERTS.

Lying between latitudes 16 and 23 south, and longitudes 25 and 30 east, Rhodesia, which a few years ago was (with the exception of a few missionaries and a stray hunter or two) almost wholly inhabited by the native tribes, can now boast of a white population of about 10,000, which, with the exception of those resident in the two centers, viz: Bulawayo, about 4000 population, and Salisbury, about 1200 population, go to make up several fair sized mining camps.

The country derives its name from the founder, the late Right Hon. Cecil John Rhodes.

In its physical aspects, Rhodesia differs somewhat from most of the Western mining States, in that few if any really high mountain ranges traverse the country. The mining districts embrace, in the broken areas, numerous small hills which gradually fade away into large areas of first undulating and then almost flat plains.

In the granitic belts quite an independent type of scenery is presented, consisting of large slightly undulating plains, dotted with countless small, conical shaped hills (kopjes) varying in height from 50 to 300 feet.

In but one instance in the whole of Rhodesia has it been found advantageous to attack the ore bodies and veins through adits or crosscuts, practically every mine in the country, if not originally, has eventually been opened up through vertical or inclined shafts.

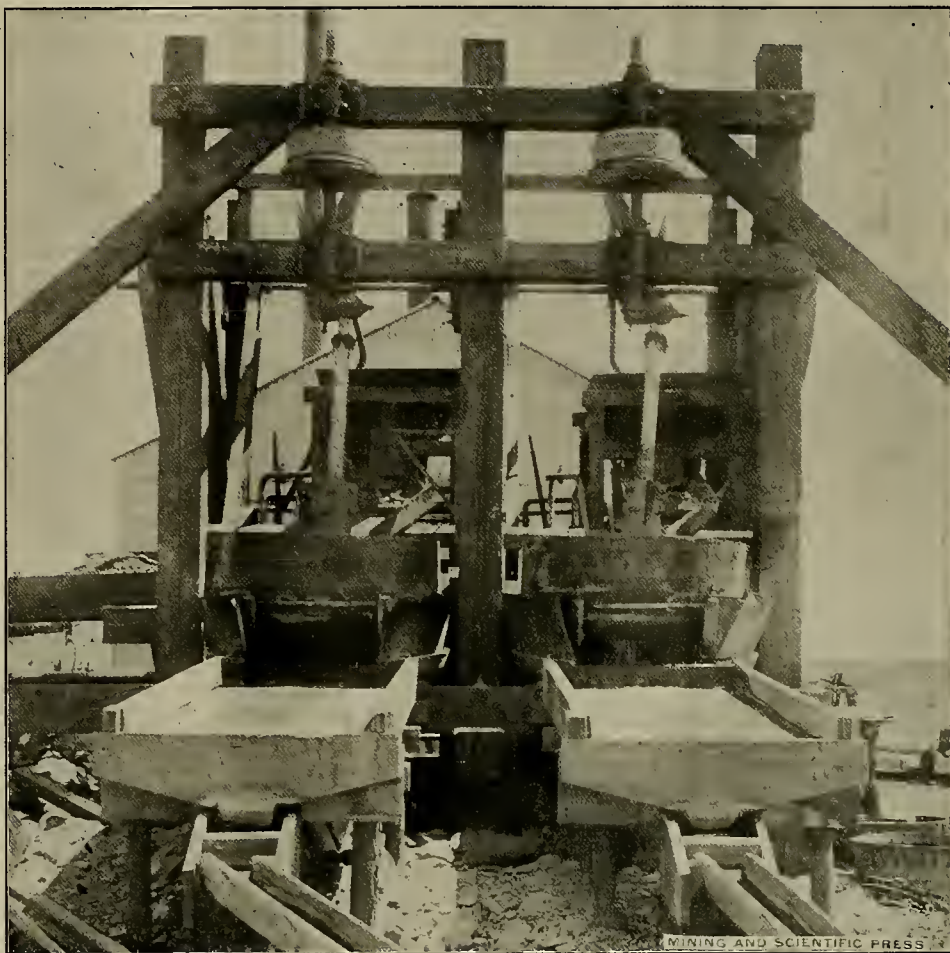
The gold mining industry is at present the only industrial source of revenue which the country can boast of, and in its commercial aspects is very difficult of comparison with those existing in other countries, as the local conditions obtaining here are peculiar to Rhodesia alone. The vicissitudes to which the country has been subjected have been numerous, unique and costly, and have militated against and deflected seriously the energy and enterprise which would have been thrown into the country, and the progress which would have been made, has in consequence been greatly hindered.

One really wonders how the present position has been attained, and what has been the source of the large sums of money which have been invested in the country.

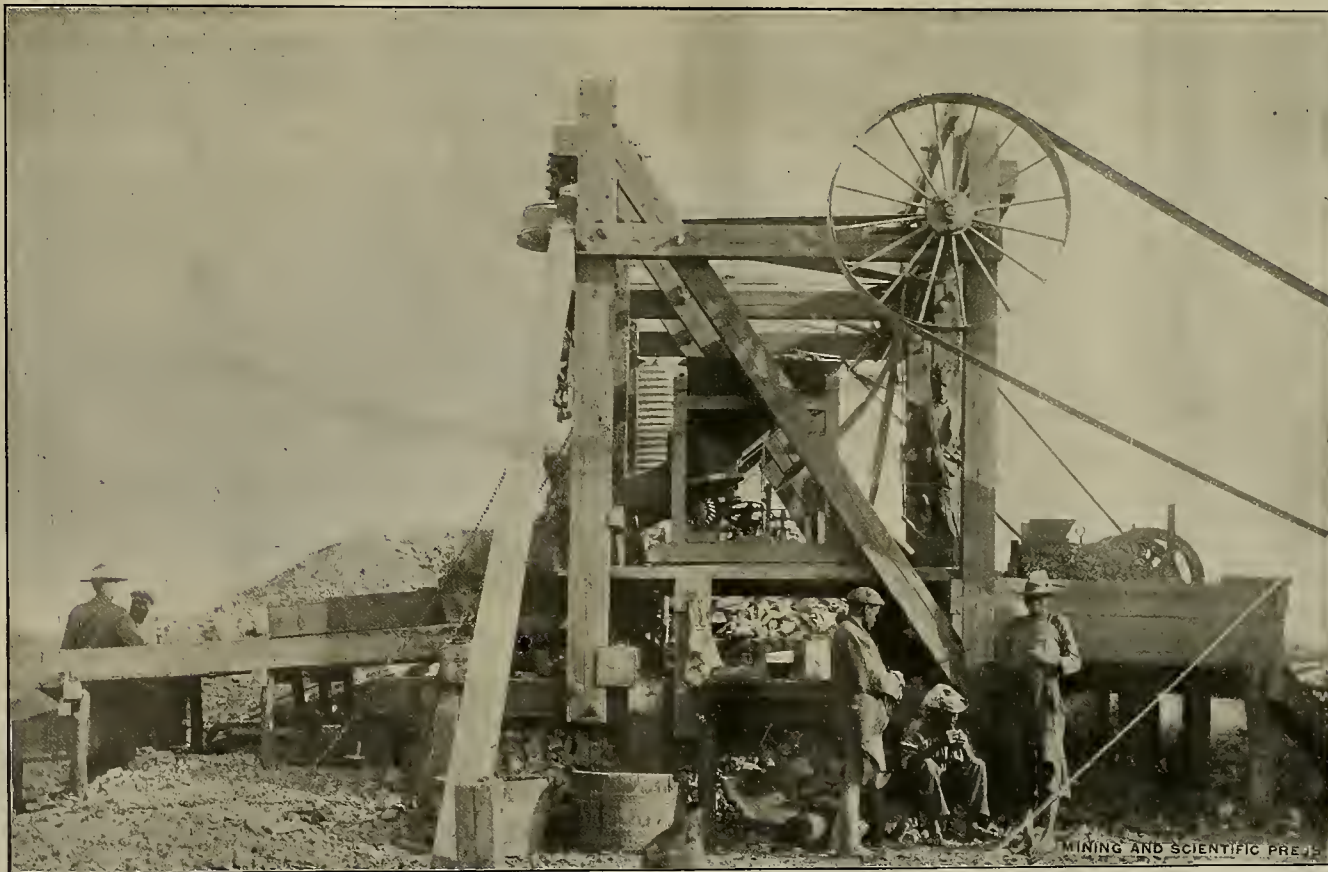
The internal system of railways, which are being extended throughout the country, are calculated to bring within easy access of the centers (Bulawayo in Matabeleland and Salisbury in Mashonaland) practically every mining district of importance, many of which have been seriously affected by reason of the

Falls) is nearing completion, and it is anticipated that within the next few months the coal being mined at the Wankies fields will become available for use in practically all of these mining districts. In some cases coal will shortly be an absolute necessity, in

as mineralogical, problems, which promise to be of especial interest and importance, and fortunately, in both instances the auriferous nature of the occurrence warrant the extension of exploratory work, and petrographical knowledge will thus be obtained



Kinkad Mill, Rhodesia, S. A.



Quartz Mill in Rhodesia, S. A., Showing Manner of Arrangement.

almost prohibitive prices and scarcity of wagon transport.

An independent line, called the "Wankies" line, about 200 miles in length (really the first link in the Cape to Cairo Railway, from Bulawayo via Victoria

others wood fuel will for a few years be the more economical.

**GEOLOGY.**—Geologically, those sections of Rhodesia which have been favored with sufficient exploitation to allow of intelligent research, present more or less the same interesting field as other quartz countries. Perhaps we are favored here with geological, as well

which might otherwise be entirely confined to theory. I refer to an auriferous diorite in one case and a gold-bearing hornblende porphyrite in the other.

A geological survey has not yet been extended in Rhodesia, hence but transient reference will be made to the rock series. By far the greater areas include the granitic rocks, these forming extensive zonal

\* See illustration on front page.



belts, having a general strike somewhat west of north and east of south. The mineralized belts embrace those sections containing the slates and schists, which strike in every direction, including areas varying from a few hundred yards wide by half a dozen miles in length, to 15 miles wide by 30 miles long.

These metamorphic rocks are traversed by numerous dikes, embracing chiefly the many varieties of diorite. In the valleys or small gulches existing in the hilly districts the alluvium is of very limited extent, suggesting a lack of these extreme climatic conditions which induce rapid erosion.

The quartz veins met with include several distinct types, probably the most common being the inter-laminated veins, which are found abundantly in the foliated rocks, while in most districts many segregated veins occur. The quartz exists, generally speaking, in more or less lenticular bodies, sometimes showing distinct isolations, and often found in parallel series, exhibiting great variations in width, both laterally and vertically. Speaking generally, the veins are of small width, and the lateral extent is not great.

At the Ayrshire mine, situated in the district of Lomagundi, Mashonaland, an auriferous diorite is under exploitation, but as yet the genesis of the gold occurrence is not clearly understood. A large amount of work has been accomplished laterally and the vertical depth reached is something over 600 feet. The irregularity of the gold contents of this dike, combined with various other characteristics, would seem to support the lateral secretion theory. It is to be hoped that, from time to time, accounts will be published touching the determinations made during the exploitation of this most interesting property.

complicated and the quantity of gold, copper and iron extracted by them must have been enormous.

While the remains of these old workings have largely aided the prospector, during the early history of the country, when conditions were more or less abnormal, there is little doubt but that the influence has been an injurious one, and has not assisted in the introduction of a thorough system of prospecting, and has, in a great measure, deflected attention from the large areas containing virgin reefs, which were probably not uncovered at the time the work was in progress.

Several calculations have been made touching the amount of gold extracted by these ancients. These estimates are entirely hypothetical and no accuracy is claimed for them, but the latest calculation reaches \$300,700,000.

The value of a mining proposition is measured by the extent of these old workings laterally and vertically, and the resulting disregard of the geological considerations has, no doubt, been directly responsible for the early failure of a number of mines.

The knowledge displayed by these ancients in the determination of the value of the ore was indeed marvelous. It is, of course, not to be assumed that they valued the important factor "width of vein," but it would appear to have been sufficient encouragement to them that a vein contained, say, a minimum value of 10 dwts. per ton. This work was no doubt extended over a very great period, for in instances where the rock had not lent itself readily to oxidation, they built fires in the stope breasts and then cast water upon the heated rock preparatory to breaking down.

In some instances where it is evident from the contours, that water difficulties were not met, they

while the seams of the drums are located at the top, away from the fire. The throat is braced with a twisted brace which leaves over 80% of the area open. The rear drum contains a mud pau through which the feed water flows, and where practically all the impurities of the water are precipitated to the bottom of this pan, from which a connection through the drum head admits of its being blown out. This mud pan or purifier is built in sections and can be removed through the manhole of the drum. The mud pan occupies small space and there is considerable generating surface in this rear drum. The fresh water from the purifier flows down through the rear leg and up through the tubes and front leg to the front drums, where there is a large releasing surface. The two drums are connected by straight equalizing tubes, arranged in three tiers along the ordinary water line. Each of these drums is connected with a middle drum by tubes and the steam, as it is released, travels through these tubes to the middle drum, from which it is taken for use. Experience has shown that, by thus carrying the steam to a third drum through tubes exposed to the furnace gases, not only is perfectly dry steam obtained, but this steam is given superheat varying from 10° to 22°, according to the state of the fire. Since all the tubes carrying water are straight and readily accessible, the boiler is easily cleaned.

### Unwatering the Comstock Lode.\*

For years numerous efforts have been made to unwater and explore the entire Comstock lode. The latest arrangement in this direction has recently been made by the Ward Shaft Association, consisting of a group of the middle mines, composed of Gould & Curry, Savage, Chollar, Potosi, Bullion, Alpha Consolidated, Exchequer, and the Julia Consolidated M. Co., who own and operate nearly a mile of the middle lode. This association, through its chief engineer, Leon M. Hall, who is also superintendent of the Ward Shaft Association, has awarded an important contract for a permanent pumping installation to the International Steam Pump Co. of New York.

It is now about twenty-six years since the largest pumps were installed in these mines, of the steam actuated type; since then science has progressed in the development of pumping appliances. The development and responsibility of successfully demonstrating that the later types of pumps will accomplish the exploring of the southern portion below the 2500-foot level has fallen on the shoulders of Leon M. Hall, chief engineer and superintendent. The northern half has already reached a depth of 3000 feet with good returns from the deepest parts. There are known to be mineralized bodies below the 2500-foot level in the middle and southern parts, where the inrush of water about twenty years ago flooded all the middle mines up to the 1600-foot Sutro tunnel level. All these levels have been idle, and it is Mr. Hall's belief that it is possible to unwater, ventilate and successfully and safely work the levels as deep as 5000 feet.

The water that was met twenty years ago on the 2900-foot level of Exchequer mine in Gold Hill was 170° F., and the temperature of station and workings about 110° F. After various efforts to handle the inrush of water it was finally decided to allow the water to fill to the Sutro tunnel. About ten years ago another effort was made to unwater the mines through Crown Point incline, which also was abandoned after an expenditure of about half a million dollars, and future workings were confined to the 1500 foot level.

At this time hydraulic pumping engines were installed together with various Cornish engines, all of a capacity to keep the water at 3300-foot level in the north mines, but the expense of operating was so great that the mines were allowed to fill up to the 1600-foot level and workings were confined to the more accessible ore bodies above Sutro tunnel. The fact that the character of deposits which were worked at higher levels will continue at the lower levels has induced the mining companies to make considerable effort to reach them; about four years ago a large hydraulic lift was installed at the Consolidated California shaft, and with this appliance the water level in the north end has been kept below Sutro tunnel about 2150 feet, and considerable amount of valuable ore has been taken out, amounting to over \$1,000,000. Having reached this level, another effort was made to go lower, installing an electric pumping plant consisting of three Reidler electric pumping engines driven by a 200 H. P. induction motor for each. These pumps take the water at the 2150-foot level and together discharge 4500 gallons per minute into the Sutro tunnel under 430-foot head. The hydraulic pumping engine serves as a sinking pump, discharging into tank at the Reidler pump.

The electric power is generated by the Truckee river, 2 miles east of Floriston, Cal. McCormick turbines are directly connected to Westinghouse three-phase generators of the revolving armature type. Each pair of wheels will develop about 1400 H. P. under head of 84½ feet. Regulation is effected through

\* See illustration on front page.



Modern Mine Equipment in Rhodesia, S. A.

The writer recently discovered an auriferous hornblende porphyrite. This rock is a most interesting one, petrographically, and is quite uncommon in this country. It consists, as seen under the microscope, of large crystals of feldspar (chiefly plagioclase), possibly with some orthoclase, and smaller calcareous pseudomorphs after hornblende, retaining good crystal outline, imbedded in a fine-grained feldspathic groundmass. The feldspars are somewhat crushed, and the alteration of the hornblende implies a certain amount of water action. This body has recently been the subject of exploitation and appears to predominate in the moulding of a small range of hills rising some 500 feet above the surrounding country. In close proximity to the porphyrite are the crystalline schists.

A superficial examination of the body shows considerable variation in width, the probable extreme being about 150 feet, while the lateral extent appears to extend for a distance of 1000 feet or more. Enough work has not yet been accomplished to enable one to make very thorough determinations respecting the geology, nor can an intelligent idea as yet be expressed with regard to the origin of the gold contents.

Samples taken over the various widths exposed return from 2 dwts. to 15 dwts. per ton, and although these results are not representative, they show the body to be of sufficient importance to suggest the production of some quite unique, if not valuable, conclusions.

ANCIENT WORKINGS.—An interesting feature in connection with the mineral industry of Rhodesia is the fact that every auriferous district in the country has been largely worked by an extinct race of people, popularly referred to as the ancients; and although some relics left by these people have been found in the bottom of old stopes, lately opened, and also about the numerous ancient ruins existing in the country, no tangible idea has yet been advanced touching their identity. The amount of work ac-

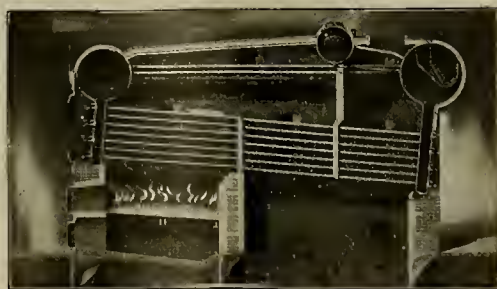
worked to a depth of no less than 250 feet on the reef plane.

Most of the producing mines in the country, as well as those upon which a goodly quantity of development is being extended, are marked by extensive old workings.

(TO BE CONTINUED.)

### The Atlas Water Tube Boiler.

The Atlas Engine Works of Indianapolis, Ind., has sold a number of water tube boilers for the use of the



Atlas Water Tube Boiler.

Japanese Government in reconstructing the dock machinery at Port Arthur. This boiler is composed of a nest of tubes, set on the ordinary incline between water legs, and three drums running across the tubes instead of lengthwise at the top. Two of these drums, the front and rear, are each a part of the same plate composing the water leg, with which it is connected. This eliminates seams next to the fire or hot gases, since the only seam in each of these legs is at the bottom, where it is protected by the masonry,



Lombard governors. The generating potential of 500 volts is raised to 24,000 volts by Westinghouse oil insulated transformer. The current is transmitted about 35 miles to Virginia City, Nev., over a double circuit of copper wire. The mining companies purchase power from the Truckee River General Electric Co., the amount used being based upon peak load to two minutes duration when the electric hoists are operated directly upon the lines; price, \$7 per H. P. per month. There are about 2000 H. P. installations on the Comstock Lode, to be increased to nearly 5000 H. P., a contract having been closed between the Truckee River General Electric Co. and the thirty-two mining companies comprising the Comstock Pumping Association, which calls for delivery of electric power draining the Comstock mines, lighting, hoisting, etc., the maximum amount being 5000 H. P. To fill these contracts for additional power, the Truckee River Co. has prepared plans for a second electric generating station and a new pole line. Water will be diverted from the Truckee river and conducted to the extreme eastern end of the company's hydraulic system, where it will be utilized by water wheels under head of 41 feet. For the maximum of 5000 H. P. the rate will be \$4.50 per H. P. per month, with proportional rates for lesser amounts. This is based on motor readings and will save the mining companies considerable money as compared with the existing contract. All motors of 50 H. P. and over are operated directly on 2240 volts, all smaller motors on 440 volts, and the lighting circuit is 220 volts, three-wire system, except Gould & Curry, which is on 110 volts.

The ventilation in the mines is of the best, as it must be, owing to the excessive heat and saturation from hot water. Most of the ventilation is of the natural type through various shafts on the different levels. The cold air is forced by electric fans to the different headings and stations. The electric hoisting engines are of Mr. Hall's design, he adopting the balanced or tail-rope system of hoisting.

The Reidler pumps were put in at the C. & C. shaft in 1902, because of inability of going any farther than 450 feet below Sutro tunnel level with the power from the hydraulic water supply for the hydraulic elevators. It proved a practical sinking pump; cost of repairs small. The Reidler electric pumping plant handles the mine water and also pressure water when the hydraulic elevators are used for sinking. When the shaft is free from water, another pumping plant will be placed at the 2550-foot level and the use of the hydraulic elevators will be abandoned.

In determining the types and designs for the Ward shaft the association were able to select the plant from the best type of pumping machinery in the world, considering the electric motor and pumping engine as a whole unit. Motors designed for such slow speed as 100 revolutions of such large capacity will give a low power factor; one of same capacity running 200 revolutions should give 15% to 20% better results, which means the amount of power saved at the generating station and less cost for operating, and on this basis high speed 200-revolution pumps without mechanically operated valves were selected.

The International Steam Pump Co. was represented by Charles C. Moore & Co., Engineers, its Pacific coast agents; its chief engineer, C. G. P. de Laval, who went to Virginia City to investigate the situation; Leon M. Hall, chief engineer and superintendent for the Ward Shaft Association, conducting negotiations for this association.

The contract calls for two first-motion electrically driven pumps, each of the units to have a capacity for lifting 1600 gallons of water per minute against a pressure equivalent to a height of 1500 feet, or from the 3000-foot level up to the level of the south lateral branch of Sutro tunnel. Each pump is to be driven by 800 H. P. slow-speed induction motor. The contract includes column pipe, travelling crane for the pumping station, automatic oil system, small air compressor for filling air chambers, a small vacuum pump operated by compressed air for discharging air from the suction chamber, all the piping and valves of every description for completing the installation and a complete set of duplicate parts of the pump.

It is intended to install a temporary drainage plant at the Ward shaft, first using an air lift to lower water to the 1800-foot level and thence down to the 2500-foot level with other pumps. The present bottom of the shaft is at the 2500-foot level, and when that point is reached the shaft will be sunk through the solid rock to the 3000-foot level, where the permanent pumps contracted for will be installed.

A descriptive cut of similar type of pump is shown herewith, which embodies all the details of the ones for the Ward shaft. Pumps of this type are built in capacities from 200 to 4000 gallons per minute and for heads from 100 to 2000 feet. Speed of pumps in the accompanying installation is 300 revolutions per minute, efficiency of pump alone is stated to be 95%, motor 92%, combined efficiency 85%. The entire machine is self-contained, mounted on a rigid box girder frame and occupies a relatively small space. It contains some novel features of construction and careful attention has been given to the design of the internal portion as well as to the running parts and oil devices. Its operation is practically noiseless under all conditions and unaccompanied by shock or heating. The weight of both pumps for the Ward shaft and their motors is about 600,000 pounds, which may

be interesting for comparison with the older pumps on the Comstock.

The Ward shaft electric pumps will have capacity of 3200 gallons against 1500-foot head and cost \$80,000. The Mexican-Union pumping engine was a Cornish type compound condensing, flywheel, Leavitt arrangement of cylinders, flywheel 36 feet in diameter, which flywheel with its shaft alone weighed 208,700 pounds; high-pressure cylinder, 64 inches diameter by 6 feet 9 inches stroke; low-pressure cylinder, 100 inches diameter, 8 feet 6 inches stroke; nominal stroke of pump 10 feet. This engine was constructed in 1880 with a double line of 14-inch plunger pumps, discharging into Sutro tunnel. Later the 14-inch pumps were replaced by 17-inch and additional 18-inch pump rods were added about 1000 feet long. The pump rods from top bob to the 2700-foot level were 2618 feet long. The total weight of moving parts was 1,620,500 pounds; total lift of water 1180 feet to Sutro tunnel from 2700-foot level station. Due to the great length of pump rods, the effective stroke of plungers was reduced from the surface stroke of 10 feet to actual stroke of 9.7 feet.

The Chollar, Norcross, Savage, Belcher and Overman were all of the compound vertical condensing engine, Davey type; high-pressure cylinders, 32 inches in diameter, stroke 10 feet 9 inches; low-pressure cylinders, 65 inches diameter, 8-foot stroke. No flywheels are used on this type and strokes are variable as in any direct-acting pumping engine. These pumps force water from 3180-foot level to Sutro tunnel, 1570 feet; total weight of moving parts 1,374,900 pounds.

In the underground station cuts at 2400, 2600 and 3000-foot levels hydraulic pumping engines were used. The ratio of power plungers to pump plungers was proportioned so pumps could make six to seven strokes per minute.

In the Yellow Jacket shaft a pump was installed in 1880 which was considered of superior efficiency. The type of engine twenty-five years ago was horizontal compound flywheel design, high-pressure cylinder, 31 inches in diameter; low-pressure cylinder, 62 inches in diameter; stroke, 12 feet. The balance bob was so constructed that pump cylinders would receive 10-foot stroke. This pumping engine took the water from the 3000-foot level, pumping same direct to the surface, having total length of pump rods of 3055 feet; weight of the moving parts, 1,510,400 pounds; engine made 5½ revolutions when 432 gallons capacity. An accident occurred to this engine closing it down until the Sutro tunnel was completed, when it was changed by a double line of pumps raising the water 1516 feet to Sutro tunnel and pumping 700 gallons per minute. A month later a heavy flow of water from the 2700-foot level of Exchequer mine was met, flooding all the lower levels. Pumps were speeded up to their utmost capacity, 750 gallons per minute, but the waters were still increasing and pumps were not able to hold it, nor could any other means at hand control the water. It was then stopped entirely.

In the Ophir mine the horizontal-gear type of engines was used, steam cylinder, 24 inches in diameter, 5-foot stroke and fitted with two flywheels; pump stroke was at surface 8 feet and 7.7 feet below; total length of pump rods (partly on the incline), 3273 feet; weight of moving parts, 1,067,500 pounds; water pumped 900 feet to Sutro tunnel discharging 280 gallons per minute.

At the Con. California shaft the engine was of the Davey differential type, high-pressure cylinder 24 inches in diameter, low-pressure cylinder 40 inches in diameter, 8-foot stroke, with 7-foot stroke for pumps. Pumps could furnish 500 gallons per minute; and weight of moving parts 860,000 pounds, with 2150-foot length of pump rods. These pumping engines cost, without foundations and installation, \$1,300,000, giving maximum capacity for all of 5400 gallons to an average height of 1152 feet; average cost for operating, about \$34 per indicated horse power per month; total amount of water pumped, 5040 gallons, to an average head of 1074 feet, with a total indicated H. P. of 1703. Total cost per month, \$58,120, or \$697,440 per year, not including repairs. The hydraulic pumps handled 2128 gallons per minute and the Cornish 2912 gallons, requiring about 2.7 miles of rods, which, together with other moving parts, made a total of 6,496,400 pounds of reciprocating details requiring same to be started and stopped nine times every minute, thus requiring 2330 pounds of moving parts for every gallon pumped.

These figures are given as comparison between modern high speed engines with small parts and light weight, as there is no heavy moving in direct-connected pumping engines, and gives at once the most flexible system, accommodating itself to any size installation. Great weights in motion limit speed, and material stresses are soon overreached, causing breakdowns and repairs. The old Comstock pumps

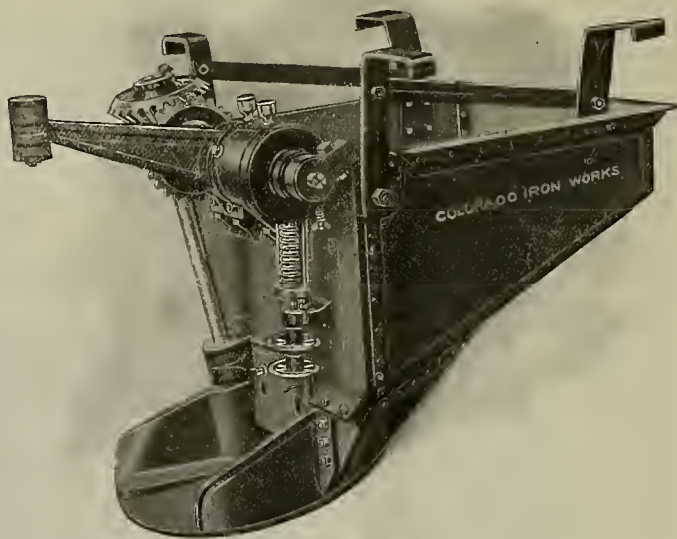
could not be increased in capacity, as extra weight brought reduction of speed, which was experimented on at the Mexican Union, where speed had to be reduced to about four revolutions per minute on account of overstraining rods, which were 18x18 inches Oregon pine and 2618 feet in length. Owing to the extreme hot water (170° F.) and high temperature of shafts, the machinery and parts had to be constantly lubricated to an excessive extent, requiring careful watching for rotting of pump rods, rusting of wrought parts and destruction. The cost of maintenance and power was enormous and could not continue with the advent of new methods and devices, with the demands of shareholders for more dividends, and newer and better types of machines were looked for, and when the C. & C. electric pumps were started a new era dawned upon the Comstock Lode. Permanent Knowles electric express pumping engines, just contracted for, will drain the group of the middle mines upon the Comstock Lode to a depth of 3000 feet through the Ward shaft.

The greatest depth ever attained on the Comstock was in the north end, in the Union Con.—3350 feet—in 1883; the present stated ability and intent to go 5000 feet indicates possibility of producing further great addition to the enormous amount already yielded.

The Comstock Lode was first discovered as a gold mine, although the subsequent discovery of sulphurets of silver among the gold eventually made it the first silver mine in the United States. But it was not until the fifth year that silver predominated over the gold, the yield for that year being: Gold, \$4,940,000; silver, \$7,460,000; total, \$12,400,000. Its greatest product in any one year was during the bonanza days of 1877, which recorded a yield of: Gold, \$14,520,614.68; silver, \$21,780,922.02; total, \$36,301,536.70. This is taken from the official Government report, Treasury Department, Washington. Afterward gold again predominated, the yield for 1885 being: Gold, \$1,729,531.25; silver, \$1,415,071.04; total, \$3,144,602.29. Gold has continued to predominate each year since. The total yield of the Comstock to date is about \$379,000,000, over \$20,000,000 being silver.

### Challenge Ore Feeder.

Herewith is illustrated the Challenge ore feeder, in which the ore is delivered by a hopper on to a disc inclined slightly from the horizontal, supported and rotated by a spindle keyed at right angles to the center of its face, the spindle journaled in boxes on the front face of the hopper, one-half the disc projecting beyond the hopper. The ore rests on approximately one-quarter of the disc inside the hopper, and, as the disc is rotated, is carried out through an opening in the front of the hopper; this opening, 12 inches wide, permits feeding coarse material, and an adjustable gate which is fitted across it, prevents the weight of ore in the hopper from forcing the ore ahead any faster than it is fed by the rotation of the disc. A guide wing encircles the outer projecting edge of the disc, thus preventing any ore from falling off the disc until the point of feed is reached; a



Challenge Ore Feeder.

cast iron scraper wing crowds the ore ahead as the disc is rotated, thus causing ore to be delivered through the feed opening, 15 inches wide.

In this feeder any lost motion is automatically taken up. The amount of feed can be adjusted while the feeder is in operation, the hand wheels governing this being within easy reach from the floor back of the mortar. The clutch mechanism is enclosed in a dust-proof casing, equipped with oil cups.

This feeder is furnished either stamp or belt driven, and equipped either with bracket hangers or rollers and track, as desired; it is manufactured by Colorado Iron Works Co., Denver, Colo.; its shipping weight is about 1000 pounds.

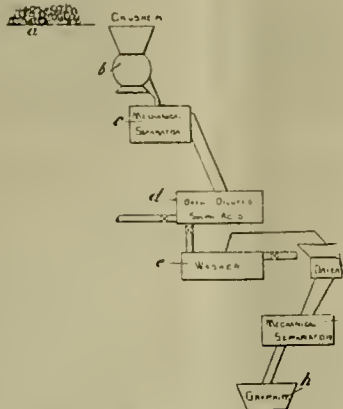


# Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 24, 1905.

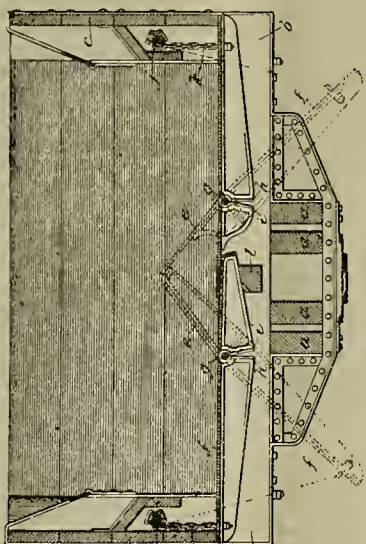
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS

PROCESS OF SEPARATING GRAPHITE FROM WOLLASTONITE.—No. 780,297; S. R. Krom, Plainfield, and S. V. Krom, Jersey City, N. J.



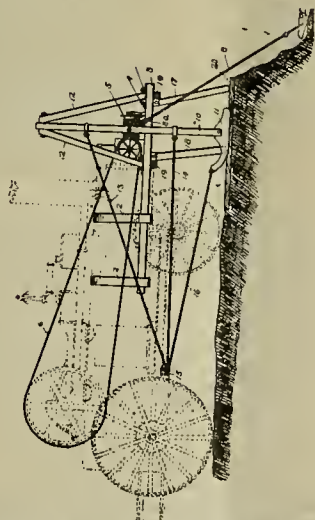
Process for separating graphite from ores carrying same, consisting in crushing ore to fine granular condition, separating major portion of graphite from ore by dry concentration, treating concentrates or residue in bath of dilute sulphuric acid so as to break chemical bond or union of materials treated and thereafter submitting decomposed mixture to concentrating washing for recovery of graphite.

DROP BOTTOM DUMP CAR.—No. 780,762; S. Otis, Chicago, Ill.



In drop-bottom dump car, combination of supporting framework, and drop bottom therefor formed of plurality of swinging sections having independently movable rear and front portions pivotally secured in position to each side of longitudinal center of car, substantially as described.

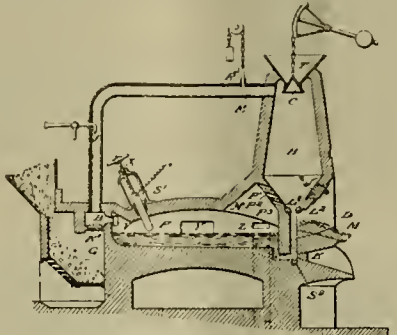
EXCAVATING MACHINE.—No. 780,686; L. Rosebush, West Bay City, Mich.



In combination with traction engine, platform secured to front end thereof; hoisting drum mounted

on platform; devices for operating drum from engine: cross beams supporting platform; forwardly and outwardly extending legs pivotally suspended from beams; upwardly and outwardly extending arms pivotally secured to each side of platform; inclined shear legs pivoted at upper ends to arms; runners pivoted lower ends of shear legs; hoisting block secured to each of shear legs; cables oppositely wound on drum and extending respectively through each of hoisting blocks; and scrapers secured to ends of cables.

PROCESS OF SEPARATING METALS FROM THEIR ORES.—No. 780,651; J. M. A. Gerard, Paris, France.



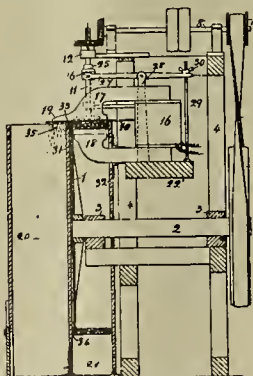
Process of producing metals from ores, consisting in heating mixture of ore, flux and carbonaceous material to reduce ore to metal sponge, passing through resulting product electric current to melt same, separating slag from metal, and subjecting fluid metal to action of electric current of high voltage and low amperage in presence of oxidizing gas, whereby metal is made to boil and rapid oxidation is effected.

AMALGAMATOR.—No. 780,529; J. B. Rossman, St. Paul, Minn.



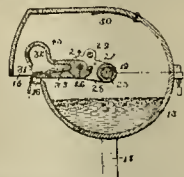
Amalgamator bowl having circular concave bottom, rubbers pivotally mounted within bowl and means for imparting to rubbers oscillatory motion about its center and over segment of bottom, whereby successive areas of agitated and dead water are produced within bowl when in operation.

MAGNETIC SEPARATOR FOR ORES OR SIMILAR MATERIALS.—No. 780,870; J. T. Dawes, Liverpool, England.



In magnetic separator combination of moving conveyor for receiving material second moving conveyor above first moving conveyor, magnet pole above second moving conveyor, and shield disposed under second moving conveyor between outer extremity of magnet pole and first moving conveyor and parallel to and in contact with side of first moving conveyor, part of top of shield under magnet pole being level with first moving conveyor.

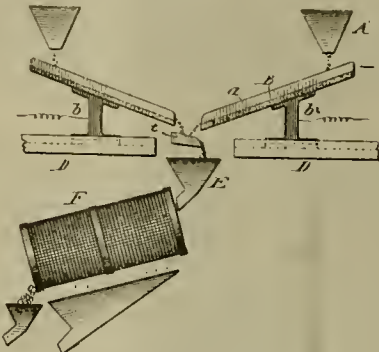
MERCURY FEEDER FOR STAMP BATTERIES, ETC.—No. 780,493; N. P. Carver, Edgecliffe, near Sydney, New South Wales.



In device of class described, combination of trough adapted to contain liquid, member rotatably mounted above trough, bucket pivotally mounted on member, eccentrically of same, bucket having peripherally disposed lifting compartment and radially disposed

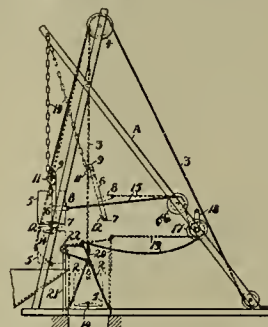
measuring compartment communicating with each other, guide for causing bucket to rotate on its pivotal axis through rotation of member for raising liquid from trough by means of lifting compartment, then causing liquid to flow into measuring compartment and finally discharging contents of measuring compartment over edge of trough.

METHOD OF AGGLOMERATING MAGNETIC ORE.—No. 780,716; Elmer Gates, Chevy Chase, Md.



Method of agglomerating magnetic sand, which consists in establishing electric arc between opposing surfaces, feeding opposing streams of sand over surfaces, and causing streams of sand to fall freely from surfaces so as to break arc originally formed and establish arcing from one of falling streams to other, thereby fusing and agglomerating sand into small lumps of size varying from that of wheat grain to that of bean.

MINING BUCKET DUMPING APPARATUS.—No. 780,629; W. R. Wilcox, Boise, Idaho.



In apparatus of class described, combination with shaft opening or like, of closure therefor, bucket movable in line of opening, dumping mechanism interposable in path of bucket, mechanism including bridle flexibly suspended from point in advance of bucket and adapted to have movement in horizontal direction to intercept bucket, and unitary means for opening and closing closure and operating dumping mechanism.

## THE PROSPECTOR.

The rock specimen from Blackbird, Idaho, is apparently a diorite aphanite, that is, a dense fine-grained diorite. It contains a large percentage of pyrrhotite, a subsulphide of iron, slightly magnetic. Nickel is often found associated with pyrrhotite and this ore should be tested for nickel.

The rock specimens from Liscum, Ariz., are a granular quartz rock in which is disseminated a quantity of specular or micaceous iron—a variety of hematite.

The rocks from F. R. J., at Northport, Wash., are as follows: No. 1 is a foliated graphitic slate containing veinlets of calcite and quartz; in the quartz are a few small crystals of pyrite, possibly gold bearing; a little pyrrhotite is also present. No. 2 is vein quartz, apparently formed in a country rock, like No. 1; it contains a little iron sulphide and may contain gold. No. 3 is a slaty rock in which occurs a large amount of pyrrhotite and a small amount of iron sulphide.

The soft, white rock from Tombstone, Ariz., marked 1. A., is kaolinized feldspar, probably an altered eruptive rock like diorite or granite, containing chalcopryite (copper sulphide), altering to bornite, also a copper sulphide. Ore similar to this is more or less abundant at the Cananea, Mexico, copper mines.

The rock samples from Tombstone, Ariz., may be described as follows: The lighter colored rock is a dense siliceous rock and is probably altered shale or limestone. It has been fractured by pressure and movement and in it occur numerous little veins of quartz. Galena is seen in groups of small crystals scattered through the mass. The dark colored rock is amygdaloidal lava containing numerous zeolites in a more or less advanced stage of decomposition.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The Continental Investment Co., at Windham Bay, has put in an air compressor and will drive a crosscut to tap a ledge shown by surface croppings.—F. Freming, working claims adjoining the Jualin mine at Berners bay, has struck the ledge.—The Greek Boys at Berners bay has been sold to an English company who will build a mill.

The Oceanic M. Co. is putting in a compressor at Sum-dum which will be used in sinking two shafts on the Sunnyside claims. Superintendent Ahrenstad has sunk one of these shafts 150 feet and the other 25 feet.

It is reported that the Ebner G. M. Co., working near Juneau, will build a 100-stamp mill. The present 15-stamp mill is running with water power.—The 300-stamp mill of the Treadwell Co. closed down on the 5th ult., after running continuously with water power, with the exception of seven and a half days, since last April—over nine months. This mill treats an average of five tons of rock per stamp every twenty-four hours, which is equivalent to 1500 tons per day.—All the mines at Treadwell are said to be yielding increased values with increase of depth. The Treadwell main shaft is now down 1000, the Mexican 1200 and the Ready Bullion 1300 feet.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The smelter at the Copper Queen at Douglas recently produced 163 tons of bullion in twenty-four hours.

Bisbee, Jan. 30.

#### Gila County.

(Special Correspondence).—The Globe M. Co. of Globe held its second annual meeting in Chicago and elected J. F. Hechtman of Globe president and manager and J. Goodwin of Globe and S. J. Collins of Moline, Ill., as directors. Sinking will be resumed on the main shaft and the Vacy Constance will be developed. The country rocks are granite, porphyry, quartzite, diorite and syenite, showing fissure veins in the diorite from 2 to 100 feet in width, with iron cappings. The ore carries copper, silver and gold. C. J. Maybush is mine superintendent. Globe, Jan. 30.

#### Graham County.

(Special Correspondence).—The recent floods destroyed the dam at the camp of the Detroit Copper Co., near Morenci. The dam was constructed to conserve the tailings and slimes from the company's plant. It is being repaired and strengthened so that it will be better able to resist any water pressure that may come against it in the future. Several improvements have been made for handling the tailings, and it is expected that the dam will not again be washed away so easily. This mine was opened in 1880 and worked open cast, as the ore bodies are of great size, though low in grade. The ores are chiefly sulphide and highly siliceous, with gangue carrying up to 40% alumina, requiring careful handling. The concentrating ore is about one-half oxides and carbonates and one-half sulphides. The ore is concentrated seven into one, using 400 gallons of water per ton of ore. Eighteen hundred gallons of water are in constant use, 125 gallons per minute of clear water being supplemented by clarified water from settling ponds and clarifiers designed by G. E. Hunt, mill superintendent. The fresh water is pumped from wells on the San Francisco river.

Morenci, Jan. 30.

#### Maricopa County.

(Special Correspondence).—J. Hauxhurst will increase the force at work on his copper property near Wood-chopper's Tanks in the Osborn district.—The Gila Gold Lode Co. are working a gold property 35 miles west of Phoenix.—A. L. Crenshaw will put machinery on his property in the Cave Creek district.—The Oriental M. & M. Co., operating in the Cave Creek district, will resume operations.

Phoenix, Jan. 30.

#### Mohave County.

C. D. Pickering, superintendent of the Yucca Cyanide M. & M. Co. at Cedar, reports the 10-stamp mill is to be remodeled and the ores worked.

W. F. Grounds of Fresno, Cal., owner of the Clay Springs mines, 22 miles north of Hackberry, has put in a 4-stamp mill 2 miles from the mines and the water piped 4 miles from Clay Springs. The mill will be started Feb. 1st.

#### Pima County.

(Special Correspondence).—The Twin Buttes Co., near Tucson, has struck a body of ore in the double compartment shaft. The ore carries copper, silver and lead. Tucson, Jan. 30.

#### Pinal County.

(Special Correspondence).—Oil has been found at Mammoth after drilling 600 feet; the well is to be continued till 1000 feet is reached. This is said to be the first find of oil in Arizona.

Mammoth, Jan. 30.

(Special Correspondence).—The Troy-Manhattan smelter at Riverside has made a successful run of ten days, but owing to the severe storms, which washed out numerous bridges on the Phoenix & Eastern Railroad, was compelled to shut down pending the arrival of supplies of fuel oil and coke which is held up on the railroad. The steam hoist has been removed from the Ninety One shaft to the main shaft and is now in commission. The boiler from the Alice shaft has also been removed to the main shaft, and with others to be placed with it, there will be a battery of four. A body of high-grade copper ore 20 feet in width has been opened in the Buckeye mine. The new double compartment shaft on

this property is now down 206 feet, and a large area of stoping ground has been opened.

Troy, Jan. 31.

#### Yavapai County.

(Special Correspondence).—Douglas Lacey & Co. of New York have a bond on the Iron King Extension claims No. 1 and No. 2, near the Iron King property, in the Big Bug district. They have been in litigation for a number of years, which was finally settled in favor of A. J. Carroll, who gives the bond. On one of the claims there is a crosscut 205 feet long.

Prescott, Jan. 31.

The Easy Boss mine, 2½ miles from Mayer, is being developed under the management of E. W. McClave of Easy City. The old shaft is 80 feet deep and the new shaft being sunk is down 100 feet and crosscutting is being done. Half a ton of ore a day is being taken out in development work.

The Pittsburg-Jerome M. Co. has sunk 160 feet on their proposed 1000-foot shaft on the Pittsburg, 2 miles south of Jerome. They will build a 1½ mile wagon road from their camp to the county road, as now everything has to be packed in over trails. C. H. Pratt is president, T. H. Houlette vice-president and S. B. Whiery secretary-treasurer, all of Pittsburg, Pa. D. S. Cochran is the engineer at Jerome, and W. A. Edeburn is consulting engineer.

### CALIFORNIA.

#### Amador County.

(Special Correspondence).—The chlorination plant at the Kennedy mine, near Jackson, has been remodeled and the new roasting furnace has been in successful operation since November. Crude oil is used as fuel and band rabling is employed. A small portable boiler is used to make steam for the oil burner. The old furnace is still standing, but is not being used. Sinking has ceased temporarily in the vertical shaft and the station and chute for the 2700-foot level are being cut. After the crosscut for this level has been started sinking will be resumed and another level opened at 2850. The 100 stamps are kept in constant operation.

Jackson, Jan. 31.

(Special Correspondence).—The Sutter Creek G. M. Co., J. Schenck manager, is developing the Treadwell mine on Sutter creek, 6 miles west of Sutter Creek, near Volcano. B. K. Worley of Seattle, Wash., has been made superintendent.

Volcano, Feb. 1.

At the Wildman mine in Sutter Creek twenty stamps are handling the ore from the 1400-foot level. The new mill at the South Eureka mine at Sutter Creek is crushing 100 tons per day, mostly ore from the 2400-foot level. The new and old mill are saving three tons of sulphurets daily. Sinking has been discontinued at the Zeila mine near Jackson while a station is being cut at the 1500-foot level. They are drifting toward the ledge on the 1400-foot level. The cement foundations for the new hoist have been completed. At the Kennedy mine they are putting in the lathes and other machinery to do all the repair work on the ground, except castings. Some repair work is being done to the first sixty stamps of the mill. With the constant jar of the stamps it has been found that the mortar posts have become worn on their cement bases. To remedy this it is proposed to drill into the solid cement and introduce wood blocks under the posts. One battery will be treated in this manner at a time, so that not more than ten stamps will be hung up at any one time.

Marsino & Sons' gravel mine, north of Volcano, is being surveyed and a shaft will be sunk and a 700-foot tunnel driven.—The machinery of the Stockton M. Co. at Mokelumne Hill has been bought and is being moved to the Burlington mine, near Sutter Creek, by Superintendent L. Smith.—A survey is being run from Martells to Sutter Creek and Amador City by the Ione & Eastern Railway so as to pass the principal mines.

#### Butte County.

The Yuba river, near the first barrier of the restraining dam being built by the Government on the upper Yuba, is to be worked by dredgers digging to depth of 60 feet, by W. P. Hammon of Oroville. On the Feather river, 35 or 40 feet has been the limit.—It is reported that a new dredger will be built on the Baggett lands, south of Oroville. These lands are 1 mile or more from the nearest point to the river and are high lands quite removed from the present dredger district.

#### Calaveras County.

On the Licking Fork, near West Point, Haley Bros. have sold a claim to an Oakland company, who are building a 3-stamp mill.—The Swiss mine in Railroad district is being worked.—In the Lincoln district, Congdon & Lunt are working the Galena claim.—The Outlook mine at Mokelumne Hill, W. T. Robinson superintendent, has closed down temporarily, a cyanide plant to treat the sulphurets being needed. A. Noyes has gone East to make arrangements for putting in a plant and ten stamps will be added to the mill.—On the Boston mine the water is being kept out, pending a sale.—The Ponge mine at Railroad Flat is running and more men have been put on. The mill is running with five stamps and five more are to be added soon.

Work has started on the Johnson mine, near Angels, under the superintendency of J. B. Luddy. A shaft is to be sunk through the gravel 300 feet, when crosscuts will be run 500 feet or more to tap the quartz ledges on both sides.

#### El Dorado County.

A. F. Levitt is grading for a 10-stamp mill to be built on the Red Raven mine, near Shingle Springs, which they expect to have in operation by the middle of April.—The Gopher-Boulder mine, near Kelsey, is to be started by John Sipp.—It is reported that the California-Bangor slate quarry, near Kelsey, will start up.—The American River Con. M. Co. of Placerville, organized to mine on the American river below where the water is diverted by the electric company, are preparing to commence operations the coming summer.

#### Kern County.

The Sunshine mine, 2 miles southeast of Randsburg,

is working twenty men on its mine and mill. T. W. Atkinson is superintendent.—An electric motor will be put in to haul the ore from mine to mill at the Yellow Aster at Randsburg, replacing mules.—The Searles M. & W. Co. are working the Summit diggings, north of Johannesburg, piping water 6 miles from the El Paso hills. Gasoline engines are used for power. A. Anderson of San Francisco, the principal owner, has been visiting the mine. C. Teagle is superintendent.

#### Placer County.

W. H. Wales, N. J. Pearson and N. T. Collins of Colfax have struck pay gravel in the Big Boulder drift mine in Secret canyon, 4 miles from Colfax.

#### Plumas County.

At Taylorsville A. Dragovich has men at work on the Austrian Syndicate mines.—T. McRele is manager at the Blue Bell mine at Taylorsville.

Superintendent J. D. Whitney has started machine drills in the New York mine, near Greenville. The mine was temporarily idle for several months while machinery, including a drilling plant, was being put in.

#### Sierra County.

It is reported that rich ore has been developed in the Empire mine at Gold valley. The company has fifteen men at work.

#### Tuolumne County.

R. Marshal has bought the Hidden Treasure quartz mine, near Tuolumne, from T. J. Ryan.—G. Weisbaum is putting machinery on the Brindle Pup mine belonging to R. Morgan.—T. F. Corcoran has sold to T. F. McGovern the Big Chunk mine, 1½ miles northeast of Jacksonville.—The Longfellow Co. at Big Oak Flat has bought the Big Betsy property and is moving the surface equipment to the Longfellow. W. S. Elkins of Colorado has sold to the Elkins M. Co. the Rainbow quartz mine, near Texas Bar, on the Stanislaus river, the Iron Cross, Mountain Key quartz mine and mill site and the Mayflower quartz mine, near Pine Log.—Near Jupiter a prospect shaft is being sunk on the Stockton gravel mine. A 12 H. P. gasoline engine has been put up.—The Mountain Belle, near Soulsbyville, has started work.

Near Groveland it is reported a 5-foot vein of big-grade ore has been found on the Justice mine, one of the Big Creek group.—The sixty stamps of the App mill are crushing ore from the mine at Quartz. Eighty men are at work.—The Santa Ysabel at Stent is being worked by thirty men.—The 20-stamp mill of the Dutch mine at Quartz is running continuously.—Ore is being packed from the New Albany mine, on the north fork of the Tuolumne river, to the Grizzly mill, near Carters.—G. F. Bartlett is developing the Mayflower mine, near Carters.—S. Knapp has bought and will develop the Wiedekind mine at Pine Log.—New machinery is to be bought for the Black Hawk mine, near Soulsbyville, which is closed because of the insufficiency of present equipment.—A. C. Johnson is running a 150-foot crosscut tunnel on the Mohican, 1 mile east of Tuolumne.—Curley, O'Brien & Fleming have struck good ore on the Bonanza, on the Tuolumne river, 4 miles above the Mohican.

### COLORADO.

(Special Correspondence).—A 40,000 H. P. electric plant to supply Leadville and other camps in the vicinity is to be built on the Grand river near Glenwood Springs. The power will be furnished for mining and domestic purposes. This is the second largest plant of its kind to be projected in the State. The other one is on the Animas river, between Silverton and Durango, in the southern part of the State. The power plant near Telluride is supplying power to different mines at Telluride and Ouray, and is said to be a commercial success. The power is transmitted a number of miles in several instances.—The Newhouse tunnel, which is now 14,750 feet in length, is reported to have tapped the Saratoga vein in Russell Gulch. This tunnel was started in 1891, but has been closed down on several occasions for various reasons. When completed the enterprise will be used for the transportation of ore as well as drainage.—An eight-hour bill has passed the Assembly, now in session. There is some speculation as to whether it will be passed by the Senate as it now reads. It is understood the utility corporations in the State are opposing its passage. The bill includes all men employed around mines, mills, smelters and in various other enterprises.

Denver, Jan. 30.

In 1903, according to Government report, Colorado produced minerals to the value of \$46,506,000; gold value was \$22,540,100; silver, fine ounces, were 12,990,200; copper, 4,158,368 pounds; lead, 45,554 tons; iron ores, \$787,824; manganese ores, \$55,710; bituminous coal, \$7,381,463; coal tar, \$30,506; quarry products, \$708,043; brick, tiles and pottery, \$2,068,310; Portland cement, \$436,535; clay, \$41,454; petroleum, \$431,723; natural gas, \$14,140; mineral waters, \$127,078; spelter, 877 tons; zinc oxide, 119,124,160 pounds; lead-zinc pigments, 4,950,000 pounds; spiegeleisen, 6882 long tons.

#### Chaffee County.

The Stratton-Massachusetts Gold Mines Co. at Buena Vista is sinking its shaft to the 200-foot level with a new steam drill. The management intends to drift under the large quartzite dyke and begin the stoping of ore at once. A 125 H. P. engine and boiler and blacksmith shop have been put in.

#### Clear Creek County.

The Orinoco M. & T. Co., near Idaho Springs, will put machinery on the Orinoco tunnel by the middle of March and will complete the tunnel which is in nearly 500 feet. S. W. Miller is manager.

#### Custer County.

Custer county, in 1904, is estimated to have produced: Silver, \$129,000; gold, \$101,000; copper, \$10,000; lead \$21,000. The lead producers were all idle for the year, but the lead mined was taken from properties where other and more precious metals predominated. At Silver Cliff the new experimental plant for the treatment of low-grade ores is completed and work will soon begin.



## Gilespie County.

W. S. Bell of Chicago has a lease and bond on Huddleston Nos. 1 and 2, on Winnehago hill, near Central City. The main shaft, 250 feet deep, is to be sunk 100 feet more. The lower tunnel is to be continued. A Merri- 10-ric is superintendent. —The Gold Dirt M. & M. Co. is building a 10-stamp mill in Campbell gulch, near Central City. It is reported that the treatment will be first by amalgamation, then by cyanide and finally concentration. The stamps will weigh 1100 pounds and have a rapid drop, fifty tons being the intended capacity of the ten stamps.

The Scissler mine on Missouri flats, in Russell Gulch, has been started. —The Newhouse tunnel is opposite the Missouri mine at the present time, and C. Pishon, manager of the Missouri, says that the water is leaving his mine and being drained into the tunnel. This will help the management in working the mine, as the shaft will be dry. Pishon has started up the Fraction mine. —The Lutz mine in Russell Gulch has been started to furnish water for the boilers in the Old Town and Peawabie mines.

## Gunnison County.

The Monometallist M. Co. has been formed with D. P. McNeill of Tin Cup, J. Cullen of St. Paul, Minn., H. A. Fulton, J. W. Singleton, J. C. Gilbertson of Eau Claire, Wis., J. Brennen of Ironwood, Mich., and G. Stenz of Ashland, Wis., as directors, to operate in Taylor park. —A. Berg has cut a number of veins in driving a 500-foot tunnel on the Phillips group in Jones gulch, near Pitkin.

## Jefferson County.

An additional smelter has been blown in at Golden by the Independent S. & R. Co., which, together with mechanical improvements, will increase the capacity of the smelter to 300 tons of ore per day. The company will add crushers and rolls to their sampler at Black Hawk.

## La Plata County.

(Special Correspondence).—A snowslide at the Empire mine, at the head of La Plata river, carried away the cook house, killing one man and injuring several others. —The May Day has had a Crano ore washer in operation for some time with good results, and has been making steady shipments. This company is using both air and electricity. Drifting and stoping are going on from the 500-foot adit, and practically all the vein matter is being shipped, the width being 1 to 7 feet. An adit is being started to cut the vein at a depth of 850 feet. A wire ropeway is being built to deliver the ore from the present workings to the county road, saving 2 miles over a steep road and trail, and it seems likely that the R. G. S. will build at least as far as the tramway terminal this coming season. —The Bonnie Girl M. Co. is working on the grade for the remainder of the mill building, and it will soon be ready for the frame and the leaching tanks. —The Chief M. Co. has doubled its force and is driving the 700-foot adit as rapidly as possible since the new strike near its property. —The Durango Girl has increased its force and will soon ship.

Mancos, Jan. 30.

## Ouray County.

(Special Correspondence).—The Atlas M. & M. Co. are installing electrical machinery for power purposes, to be used in driving the 2000-foot crosscut. Preparations are also being made to put in a cyanide mill on the property as soon as the weather will permit. The company owns 205 acres in Sidney basin. They have 1200 feet of development work done on the vein. The ore is free milling. Manager F. Carroll states that 70% of the values can be caught on the plates. The mill will be put on Soffles creek, 2500 feet from the mouth of the crosscut.

Sneffles, Jan 31.

## San Juan County.

The Hamlet M. & M. Co., near Howardsville, 7 miles north of Silverton, in Maggie gulch, will build a 50-ton mill.

The Silver Lake tramway line near Silverton, which was so badly damaged by fire on December 15, will be rebuilt by March 1. The mill of the Silver Lake mine remains idle, but at the mine 100 men are employed. —The Bagley crosscut, 1 mile above Animas Forks, is 400 feet long and is making headway as rapidly as possible with two shifts of men with machine drills. Electric power is being used. —The Mayflower group in Arrastra basin is being worked by J. C. O'Neill and associates of Chicago, Ill. A contract has been let for the continuation of the crosscut which is now in 350 feet to intersect the Mayflower vein.

C. C. Harding of Silverton is putting an electric light and power plant on the Old Hundred; the new aerial tramway is completed.

The Edward-Ruth G. M. Co. has been formed to work the Esmeralda properties in Minnie gulch, near Silverton, and will build a mill for concentrating and cyaniding. The directors of the company are W. J. Ratlie, R. W. Hollis, C. A. Klotz, L. Rosenfield and D. E. Carmichael, with the principal office in Silverton.

## Summit County.

P. Fisher is working on the Queen of the West mine, near Kokomo, driving to cut the ore shoot. —The Michigan mine, on Sheep mountain, near Kokomo, is shipping fifty tons daily. —The Union Con. group, which has been using an electric drill in their tunnel, will put in a compressor and air drills. Until recently they were running the electric drill with water power, but now the water is mostly frozen. —The Result and Lawrence, on Gold hill, are driving long tunnels. —The Robert Emmet group, sold to Cleveland parties last year, will be worked. —The contractors on the Bird's Nest, near Kokomo, are pushing development on the crosscut tunnel.

## Teller County.

The annual report of the Vindicator Con. M. Co., at Cripple Creek, for 1904 shows: Net production, tons, 15,344.329; gross proceeds, interest, rent, water and ore, \$490,279.51; total expense, \$315,494.34; profits from mining, \$174,785.17. The labor cost was \$120,007.85.

## IDAHO.

## Idaho County.

The Standard mine at Roosevelt, O. M. Snyder superintendent and J. Cawley foreman, is between the Sunny-side and H. Y. It is reported that a vein 50 feet wide has been cut, running from \$20 to \$500 per ton.

The main shaft of the Oregon in the Four-Mile district, near Grangeville, is 100 feet deep. A mill is to be put on the property in the spring.

## Shoshone County.

Work has been resumed by the Iron Spar M. Co. on its property south of the Leslie near Wallace.

The Federal M. & S. Co., the Morning mine and the Hecla M. Co. will institute provident and accident insurance associations for their employees, commencing Feb. 1. Recognizing that mining is a hazardous business and occupation, and notwithstanding the adoption of the most stringent rules and regulations by the mining companies to protect their employees from injuries while in the performance of their duties, the associations are formed for the benefit and protection of both employee and employer, and to provide a fund to render assistance to the injured during the period they are incapacitated for work or to their families in case of death. The system that will go into effect here is patterned after the one in vogue at the Drumlunnon mine in Montana. There will be three distinct associations, one for each of the three concerns. They will be similarly but entirely separately operated. That of the Federal Co. will be known as the Federal Provident & Accident Insurance Association. The other two will be the Morning Provident & Accident Insurance Association, and the Hecla Provident & Accident Insurance Association. The Federal Association will be governed by a board of six trustees, three of whom will be elected by the employees and three by the company. Of the three elected by employees one each will be chosen from the Burke, Mace and Wardner mines of the company. Each of the other associations will be governed by four trustees, two of whom will be elected by the employees and the other two by the company. It will be imperative for every employee of the companies to become a member of the association and subscribe \$1 to the relief fund for each month, or any fraction of a month over ten days. For a fraction of a month less than ten days the dues or subscription will be 10 cents a day. The amount of the subscription is to be deducted from the wages at each pay day or at the time the member's services in the company cease, and paid to the association. For every \$1 monthly subscribed by the employees the mining companies will contribute monthly 50 cents. In consideration of this payment the association guarantees to protect the mining company from all liabilities on account of injuries received by a member of the association during his employment by the company. The employees are given insurance at a low rate. Every employee of the companies also pays \$1 a month hospital dues. Hereafter if an employee sustains an injury in the performance of his duty, not only medical attendance and care are assured, but in addition a weekly stipend that will serve to provide the wants of his family during his incapacity. In case a member of the association is disabled by reason of an accident, the articles of the association provide that he shall be entitled to receive relief from the funds of the association at the rate of \$10 per week for every week he is unable to work, not to exceed ten weeks. In the event of the death of a member of the association from injuries received while in the employment of and at work for the mining company, a surviving wife and children shall be entitled to receive \$1500 out of the funds of the association. When so paid, "all obligations on the part of the association and the mining company on the account of such injuries or death shall cease," and in no case shall such money be applicable to the debts of the deceased or liable to be attached by his creditors, the obligations of the association not being to the deceased himself in such event, but to the widow and children. There is no liability in this case unless the death occurs at the time of or within six months after the injury, and that the latter is the approximate cause thereof. In the event of a member becoming totally blind, or so crippled or lamed as to be wholly and permanently disabled from all labor whatsoever thereafter through accidental injuries received while actually engaged in work or labor for the mining company, such member shall receive out of the funds of the association \$1500 in full for all claims and demands; and when a member shall in like manner lose the sight of one eye, or become wholly crippled in one limb, and thus become partially unfit for labor for all time, he shall receive out of the funds of the association \$750 in full payment for all claims, and these amounts will be in lieu of all weekly compensation, and when paid "all obligations on the part of the association and the mining company on account of such member shall cease." The articles provide that neither a member nor his widow or children shall be entitled to any relief when the injury or death is the result, in whole or in part, of drunkenness, fighting, immorality or the criminal negligence of such member; but the board of trustees shall have the power, notwithstanding such fact, to grant such relief as it may deem in its discretion just and equitable. About 1500 men will become members of the three associations, who will pay into the treasuries \$1500 a month. The mines will contribute \$750 a month, making a total subscription of \$2250 per month into the relief funds of the three associations.

## MONTANA.

## Beaverhead County.

The Silver Fissure M. Co. has been formed to work the Polaris mine and adjoining claims in the Lost Cloud mining district, 40 miles west of Dillon. The directors are H. Willets of White Plains, N. Y.; E. Cochrane of New York City; H. H. Arnstead of Butte, Mont.

## Broadwater County.

The 100-ton concentrator, built by Caird & Hawkesworth of Helena for the Mason properties near Hassel, will be running by February 10. They are running a 1200-foot tunnel to tap the ore bodies at greater depth, being in over 700 feet.

## Fergus County.

J. A. Drake of New York has paid \$25,000 to take up an option on an interest in the North Moccasin mine, near Kendall. Four thousand feet of ground has been prospected by diamond drilling.

At the Kendall mine, North Moccasin, Finch & Campbell of Spokane, Wash., have made a raise from the 500 level to reach the surface. When timbered the hoist will be set to use it as a compartment shaft. It is expected that the hoist will be in operation to the 500 level in about four months, and the shaft will then be driven on to the 800 level to encounter the new ore body located by the diamond drill. The shaft will be continued to the 1000-foot level. A 150 H. P. electric hoist, having a speed of 1000 feet per minute, large sinking and station pumps and a new compressor have been ordered. The Kendall is employing 100 miners and turning out 300 tons of ore daily.

## Silver Bow County.

The Speculator M. Co. at Butte has raised its output from 150 tons per day to 350 tons and expects to continue until it produces 500 tons daily. Recent development work in ground acquired by the company is responsible for the increase. It is claimed that the Edith May, bought by the Speculator, contains a vein of copper-silver ore, and the company is now drifting in it. The Speculator mine is developed by a 1600-foot three-compartment main shaft sunk in the granite and connected with the ore bodies by crosscuts and winzes. —At the Alice mine at Butte, Manager Buzzo has opened the zinciferous vein at the 400, 500 and 600-foot levels and repaired the stations and crosscuts leading from the stations to the vein. The Montana Zinc Co., which has overhauled the 60-stamp mill of the Alice to treat the zinciferous ore, is ready to commence its final test run on 500 tons of the ore. This ore is now in the bins. It averages from 12% to 20% zinc, from 6% to 8% lead, from 6 to 10 ounces in silver and from 60 cents to \$1.60 in gold per ton. The vein from which it was taken is 20 feet wide on the 600-foot level, from 20 to 30 on the 500 level and from 25 to 50 on the 400 level. Above the 300-foot level it merges into the oxidized body. A mine carload of it weighs 1900 pounds, which is 700 pounds more than a carload of the oxidized ore weighs and 500 more than a carload of the gray class or sulphure ore. In the Parrot addition, fifteen claims are yielding copper-silver ore in paying quantities. They are being worked principally by individuals. The Butte & Boston and Geyman companies are developing two claims there and extracting ore.

## NEVADA.

## Esmeralda County.

(Special Correspondence).—The Royal M. Co. of New York is a new company organized to prospect mining claims they own, just north of the Sandstorm and Kendall mines, with a drilling outfit. These claims consist of the Sol, Kemp, Frear, Cox, Brooks and Hen, and adjoin the property of the Sierra Nevada Development Co., near Columbia.

The Goldfield-Tonopah Con. Mines Co. of Chicago, who are operating on the Red Butte No. 1 at Diamondfield, in their crosscut on the 70-foot level have struck a vein carrying good values and with defined foot and hanging walls. This extends the Diamondfield belt northerly beyond the Quartzsite and Great Bend mines. Red Butte No. 1 is northwest a short distance from the Great Bend and east of the Tonopah Club. This strike on the Red Butte No. 1 is the latest development at Diamondfield. J. D. Hoff is consulting engineer for these mines.

Diamondfield, Jan. 27.

## Lincoln County.

It is reported that active operations are to be started by the Deer Lodge M. Co. at Fay, based upon examination by J. J. Trenam and F. W. Galigher. —At the Quartette mine at Searchlight Assistant Manager G. B. Wilson and Millman P. J. Johnson have put in electric bell signals, using a lever instead of a push button, causing less chance for mistakes. The amount of water in the shaft is increasing. —The 100-foot upraise from the face of the Empire tunnel to the surface has been completed. —De Berry & Kaiser are placing a whim on the Mondamin mine, near Searchlight, preparatory to sinking and drifting to the hanging wall. The shaft is down 125 feet. —The mine operators at Searchlight and vicinity have agreed upon a wage scale and card system, to become effective on Feb. 15, 1905. All employees working underground must be raised or lowered, one way, on their own time. Eight hours shall constitute a shift's work underground; on top it shall be nine hours. Miners employed in sinking winzes shall receive \$3, except when in wet ground, when the wage shall be \$3.50. Mining in dry ground \$3, mining in wet ground \$3.50, up-raising or in bad air \$3.50, sinking in dry ground \$3.50, muckers in wet ground \$4, muckers in dry ground \$3, trammers in wet ground \$3.50, engineers \$3.50, timber framers \$3.50, timbermen \$3.50, tool sharpeners \$3.50, skip tenders \$3.50, special pumpmen \$4, blacksmiths \$4. The agreement has been signed by the Quartette M. Co., Searchlight M. & M. Co., New Era M. Co., Pompeii M. Co., Santa Fe M. Co., De Berry & Kaiser, Southern Nevada M. & M. Co., Duplex M. & M. Co., Good Hope mine, Saturn M. Co., Wilson M. Co., Mondamin mine.

## Nye County.

It is reported at Liberty, 20 miles north of Tonopah, that the Cramps of Philadelphia are to put up two large mills as soon as the railroad can transport the machinery, which has been ordered and shipped.

The Eureka Sentinel says the best route to Goldreed, in the Kawich range, is from Eureka to Fish Creek, 16 miles; Fish Creek to Willow Creek, 22 miles; Willow Creek to Hicks', 18 miles; Hicks' to Moore's, 14 miles; Moore's to Hot Creek, 18 miles; Hot Creek to Twin Springs, 20 miles; Twin Springs to Revell, 19 miles; Revell to Goldreed, 22 miles.

## NEW MEXICO.

## Colfax County.

The steam dredger on the Moreno property, near



Elizabethtown, which is being operated by the Oro Dredging Co., is being repaired for work this spring.

#### Grant County.

The one furnace, which was blown in at the Comanche smelter at Silver City, January 1st, has been in continuous operation ever since. The company is contracting for ore from various parts of New Mexico and Arizona.

#### Luana County.

E. E. Burdick has recently purchased the Hancock, near Hermanos district, and will start development. The Big Helena and Hard Times mines, near Cook, have been bought by the Tri-State M. Co. J. E. Britton is superintending work.

#### Otero County.

The Standard Lithograph Stone Co. is putting in machinery near Higbolls.

#### Santa Fe County.

The Sunny Slope M. Co. has resumed work at San Lazarus, in the New Placers district.

### OREGON.

#### Baker County.

T. M. Anderson will put a steam hoist on the Uncle Sam mine on First creek, east of Malheur. The double-compartment shaft is down 85 feet and is to be sunk till 300 feet deep. The placers of the company are to be worked this spring. The Daisy M. Co., adjoining the Uncle Sam, expect the 30-stamp mill that they are building to be completed by Feb. 15.

The 10-stamp mill for the Belcher mine, near Greenhorn, is to be put up when weather permits. F. L. Daines is superintendent. H. H. Nicholson is in Denver completing tests on the cobalt ore from the Standard mine preparatory to ordering a reduction plant.

#### Lane County.

W. B. Hartley, in charge of the Star Consolidated property at Bohemia, reports that 3000 feet have been driven and that a new ledge has been opened. A mill may be put up during the present year.

#### Josephine County.

C. D. Smith is working the White & Benson placer mine on Humburg creek, 2 miles above Applegate. The Sucker Creek M. Co. are prospecting on Sucker creek, 10 miles above Illinois river, near Grants Pass. The method is to sink shafts to the bedrock, the creek bottom being cross-sectioned at regular intervals. Should the prospecting prove satisfactory the company will put in a dredging plant, but will use a steam shovel rather than a bucket dredger. P. Rowe is president, W. H. Townsend vice-president and H. Warner secretary and treasurer, all of Seattle, Wash.; W. Symmes of San Francisco, Cal., is the manager. The work at the mine is under the supervision of H. Warner and W. H. Townsend. On the Coast Range divide, 16 miles west of Kerby, H. J. Isaacs of Grants Pass and H. Mills, D. Mortiny and G. Howard of Placer, have found a promising copper-gold vein.

A rich strike of free milling ore has been made on the 300-foot level of the Granite Hill mine. The ledge at this point has a width of from 5 to 7 feet. The vein dips about 65°, and is close and compact with well defined walls. W. J. Morphy is manager, L. Y. Wickersham, superintendent. The new turbine, developing 100 H. P., is installed. The power from the turbine is transmitted by dynamo and motor. The big pump has been moved from the 237-foot level to the 300, and a smaller pump is set in the old station. The three pumps installed obviate all danger of flooding, as they have a combined capacity of 22,000 gallons an hour. The present battery of ten stamps will be doubled.

### SOUTH DAKOTA.

#### Custer County.

W. W. Olds, president of the Ruberta M. & M. Co., has purchased machinery for a cyanide annex that is to be operated with the stamp mill at the Ruberta mine, west of Custer. The Saginaw M. Co. has blocked out 200,000 tons of ore in its mine 8 miles northwest of Custer. A crosscut is being run from the lowest workings on the property to open up more of the ore above. A number of diamond drill holes put down on the dip of the vein have found three ore ledges of large size, which will average better than \$8 a ton at a depth of 500 feet. The company has had a number of carload tests made on the ore and a mill will be built this season of 100 tons capacity.

The officers of the Interstate M. & M. Co., operating near Custer, are: J. H. Godden, Emmetsburg, Iowa, president; J. Donegan, vice-president; E. H. Soper, Emmetsburg, Iowa, treasurer; A. G. Hortue, secretary; W. R. Millham, Custer, general manager.

#### Lawrence County.

(Special Correspondence).—Several years ago when the old shaft of the Horseshoe Company was sunk just above Terry some ore was found near the bottom of the shaft, but as the first assays did not indicate an ore body of payable value, little attention was given it. During the progress of work recently done there further tests were made and it is now known that there is available a large quantity of a paying grade of ore. The shaft had passed completely through the ore body, but the new work is demonstrating that appearances are sometimes deceiving, for it is said the ore is of better grade than that which has been treated in the Horseshoe mill for some months past. The shaft had been idle for years and filled with water. It was thought that if the water was raised from this shaft it might have a beneficial effect on the amount of water in adjacent workings, where it could not be handled as cheaply as through the old shaft. When the water was removed from the shaft prospecting revealed the ore body now being developed.

Terry, Jan. 27.

It has been unofficially announced that the March dividend of the Homestake Company will be 50 cents per share instead of 25 cents, the usual amount. The

Safe Investment Co., developing claims on Box Elder creek, near Perry, contemplates building a mill. A contract to sink a shaft 100 feet deep and drive a crosscut has been let. It is reported that a large body of gold ore has been exposed on the adit level. J. A. Webb of Deadwood is superintendent. The Victoria M. Co. is preparing to build a mill on its mines near Spearfish canyon and Squaw creek. The ore occurs in limestone, and development work has blocked out a large tonnage of ore. G. S. Jackson of Deadwood is manager.

The statements of milling operations of the Spearfish G. M. & R. Co. for 1904 show:

	Net Tons.	Heads.	Tails.	Recovery Average	Total Cost	Per Ton.
January	4,111.2	\$4,652	\$ .866	15,709.31	\$13,285.90	\$3.22
February	4,544.1	4,631	.71	21,534.34	12,355.50	2.55
March	4,723.8	4,627	.832	17,187.44	12,555.22	2.59
April	5,539.69	3,647	.828	17,310.24	12,650.22	2.28
May	5,587	3,471	.457	18,500.46	11,557.99	1.97
June	5,361	3.33	.452	16,184.80	11,604.78	1.98
July	5,723	3,074	.437	16,102.02	11,503.23	2.01
August	5,349.6	3,055	.51	15,307.36	12,107.50	1.45
September	7,276.6	2,611	.674	15,991.57	11,508.84	1.59
October	7,171	2,734	.628	14,855.74	11,473.60	1.60
November	7,125.8	3,007	.55	15,499.59	12,455.05	1.74
December	6,279.48	3,065	.576	12,998.03	12,531.28	1.994
	72,871.37			197,490.89	\$145,361.30	
Average Tons	Per Ton	Per Ton	Per Month	Cost Per	Per Ton	
6,062.61	\$3.499	\$ .635	16,457.57	\$12,135.94	\$1.998	
Average recovery per ton						2.71
Average cost per ton						1.998
Average profit per ton						.712

The Jupiter mine, near Deadwood, is being developed by W. L. McLaughlin and E. Manion. The Mining Review says that the Branch Mint M. & M. Co.'s plans embrace the construction of the largest wet crushing cyanide mill at Galena, the plant to contain 180 stamps and have a daily capacity of 900 tons, maximum; a hoisting plant capable of raising 1000 tons of ore per day from a depth of 1000 feet; this hoisting works to be under the same roof as a crushing plant, equipped with the Gates crushers, and the operation of a railway for ore and supply haulage between mine and mill. In the mill twenty stamps are completed. At the hoisting works the grading is finished, and a portion of the machinery set in position. Large Scotch marine hoilers are being put up. The railway grade is completed, except a few cuts in solid rock. J. D. Hardin is manager. P. T. Newitt, general manager of the Lexington Hill Co. at Deadwood, has encountered the quartzite in the 1400-foot tunnel, 500 feet below the surface. With this tunnel as a starting point, raises will be made to the surface, with the stopes in the various ore bodies. Ore will thus be broken to the best advantage, dropped to chutes at the tunnel and trammed to the mill, which is a few yards from the portal of the tunnel. The company intends to increase the capacity of its mill by adding forty stamps, with cyanide annex.

#### Pennington County.

The Wealthy group of mines near Keystone has been sold to the Eagle Rock M. Co. There is a 20-stamp mill on the property, which is to be put in repair immediately. A cyanide plant is to be built by the Mainstay M. Co. at the Bismark mine, near Keystone. T. R. Griffith is general manager. The 10-stamp mill of the Tykoon mine, northwest of Keystone, has started after a short shutdown for repairs.

The Mainstay M. & M. Co. of Keystone will equip its 30 stamp mill with a complete cyanide plant. T. R. Griffith is manager. The Black Hills Electric Power & Mining Co., working on Rapid creek, intends to install a large plant capable of handling 1000 yards a day on its placer mine.

### UTAH.

#### Salt Lake County.

At the Yampa smelter at Bingham the new reverberatory stack and building which is to surround it is finished. The second roasting furnace, installed by Superintendent H. C. Bellinger, is said to be doing its work very satisfactorily and is producing a much better grade of matte than was possible with the original furnace. The Yampa is producing fifty tons of matte a day.

A rich lead vein has been struck in the Tilden No. 2 tunnel of the old Phoenix property. The company intends widening the tunnel so that electric motor cars can be used in transporting the ore from the stopes to the ore bins, a distance of 2800 feet, and is also considering means for more rapid and economical shipment to the smelters—probably by a gravity wire tram across the gulch to the Copper Belt. The ore bins are being enlarged from a capacity of 200 to 500 tons. H. A. Gebhart, Jr., is superintendent. The Yampa at Bingham has put an electric generator and motor into the mine to dispense with horses in the tunnel. The work is under the supervision of Superintendent W. J. Craig.

### WASHINGTON.

#### Ferry County.

The Quilp mine on the Republic & Kettle River Railway, near Republic, will resume work and start shipping. E. L. Tate is manager.

Superintendent Case of the California mine at Republic reports that the shaft has been unwatered sufficiently to admit of operations as low as the third level, where there is stopeing ground left, and he will put men to work removing the ore as soon as some needed timbering is attended to. He thinks there is ore enough left in the old workings to keep the miners busy stopeing for several months. The Gold King M. & M. Co., whose property adjoins the Belcher mine on the north at Republic, is considering resuming work. G. S. Moody is president, T. M. Hammond vice-president and R. W. Hunner secretary and treasurer. Work has been resumed on the Elk mine at Bodie camp with a small force.

#### Okanogan County.

The Buckeye Free G. M. Co. at Chesaw is working three claims, with a tunnel which follows the ledge. The ore is being stored in bins near the mine, awaiting the completion of a 10-stamp mill. At the Bimetallie, south of Chesaw, W. C. Peay, the general manager, says that the company will put up a matte furnace this summer for the reduction of Bimetallie ores. Men are

working the Grant mine on Copper mountain, near Chesaw, under the management of J. A. Anderson. The Opal and the Ben Harrison companies have joined in putting up a 10-stamp mill at Cbesaw, and have the machinery on the ground. The completion of this will give the camp four mills.

The Ruby M. Co. on Chopaca mountain, near Night-hawk, which has been doing prospecting and development work on its claims for eighteen months, has uncovered good ore. A shaft was sunk 200 feet on Chopaca mountain and two crosscut tunnels were run. Exploration of the main ore body shows that the vein is from 3 to 20 feet in thickness. It has been uncovered 200 feet deep and 1400 feet in length. The main body of ore is a soft sulphide, easily worked and lying in an outside casing of talc, surrounded by granite. The values are silver, gold, copper and traces of zinc and lead. The shipping ore averages \$50 a ton. Five hundred tons have been already taken out and six 200-foot chutes in the mine have been filled. J. M. Hagerty, the president of the company, has been East with a quantity of samples of the ore, in order to have expert chemical analysis made and a reduction process devised that is adapted to the peculiar chemical conditions. Baker & Burwell of Cleveland, Ohio, have devised an electric chlorination process. The firm has contracted to install a 20-ton plant for the reduction of this mineral, at a guaranteed cost of \$2.50 per ton. The electrical current is to be supplied by the Similkameen Falls P. & Dev. Co.

#### Stevens County.

The Turk M. Co., working the Turk mine at Deer Trail, has shut down the new smelter which was recently installed. A bell and hopper feed is being put in on the preliminary furnace. This is a water jacketed Blanchard furnace, 3x5 feet inside. The company is building a wagon road from the Spokane river at the Detillion bridge to the mine, upon which a large 110 H. P. traction road engine may be used in hauling coal, coke, etc., to the mines. The materials will be hauled by teams, as they now are, to the Detillion bridge and taken from there to the mine by engine.

#### Whatcom County.

In a report urging that a wagon road be built over the present trail east of Marble mountain, F. C. Teck shows that in the Slate Creek district 56 miles of trails and 83 miles of wagon roads have been built at a total cost of \$185,000. There are 101 buildings in the district, which cost \$62,000. The mines and prospects of the district are developed by 4435 feet of prospect tunnels and 11,377 feet of working tunnels, shafts, etc., at a cost of \$157,694. The mines have 9330 tons of ore on the dump and 432,000 tons blocked out, ready to mine. The average value of the ore is \$13 per ton and the total value of ore on the dump and blocked out is \$5,737,290. There are thirty-five stamps in the district. The output prior to 1904 was \$385,000 and the output including 1904 has been \$417,000. There are 888 tons of concentrates at the mines, valued at \$79,200. In 1904 208 men were employed in the district. The distance from Rockport, the present terminus of the Great Northern Railway, to Slate creek or Barron is 64 miles. The distance to be covered by the proposed wagon road from Marble mountain to Mill creek is 46 miles. The distance to the railroad via the Methow and Columbia river route to Wenatchee is 150 miles. Freight charges by the present route from Wenatchee are: From Wenatchee to Brewster, 70 miles by steamer, 50 cents per 100 pounds; from Brewster to Robinson, 68 miles by freight wagon, \$1.10 per 100 pounds; from Robinson to Barron, 12 miles by narrow wagon, 50 cents per 100 pounds. This makes a total of \$2.10 per 100 pounds for the 150-mile trip.

### FOREIGN.

#### AUSTRALIA.

##### Queensland.

The U. S. Consul at New South Wales reports that during the past year a mine of graphite has been successfully worked on Mount Bopple, 3 miles from Netherby, on the north coast line, and 35 miles from Maryborough. The material found is of very good quality, and the output is likely to be considerable. At a depth of 32 feet 35 tons of graphite were obtained in cutting through a large mass, and on continued sinking operations, fine seams varying from 1 foot to 6 feet have been reached. Several shipments have been made to the paint manufacturing firms in the south, and have brought about \$50 a ton. Trial specimens have also been sent to some large firms in England and Germany. The famous mines in Cumberland, England, worked as far back as 1550, have given out, and the main supply of British and American graphite manufacturers now comes from Ceylon. The crude ore, in which there is a mixture of silica and sulphur, is sent to the manufacturers for purification and preparation for trade purposes. Graphite deposits are not common; they are found, it is said, only where Carbonaceous rocks are in direct contact with igneous rocks. Elaborate machinery is not required in mining it; the chief difficulty is from its greasy, slippery nature, which makes very careful timbering and handling necessary. It is much used in the production of non-corrosive paints and crucibles for smelting gold, in iron foundries, and for lubricants and household purposes. The price here of graphite paints, containing about 35% of pure graphite, has been as high as \$390 a ton; graphite for molding purposes has brought as much as \$224 a ton in the Australian foundries, and some of the crucibles for gold have cost \$975 a ton.

A recent official report on the Mount Morgan mine states that the new underlie shaft is 119 feet deep. The country is treacherous and the work has to be done with care. Two diamond drills are in commission and 900 feet of drilling was accomplished during November. In the 750-foot level the chamber in the copper ore is rapidly increasing. This cut is now in about 250 feet in a solid body of ore. The chamber is being widened and wide drives are being cut into the sides to have a number of faces ready for an increased force. In the 850-foot level driving is being carried on, but no ore has been mined at this depth. In driving along the ore body at this level pay ore was touched at several points.



The new steam shovel has now been operating in the open cut for a month. Its capacity is from 10,000 to 12,000 tons of overburden monthly. The returns from the Mount Morgan mine for November show that 12,508 ozs. 5 dwts. of gold was won from 14,522 tons of stone, and that for three months 11,191.65 tons of old tailings have been retreated for a yield of 1211 ozs. of gold. The copper precipitating canals caught 25 tons 1 cwt. of copper precipitates, containing 19 tons 10 cwt. 3 grs. of metal. The copper smelter for the month produced from 740 tons of copper ore, and by-products mixed, 70.34 tons of matte containing 32.99 tons of metal, and 589 ozs. 19 dwts. 13 grs. of fine gold. The value of the output for the month from the mine aggregates \$58,412, calculating copper at \$62 a ton, local value. The 740 tons of copper ore put through, the smelter yielded 4.45% of metal. The copper ore treated yielded 14 dwts. 14 grs. of gold to the ton, in addition to its copper contents.—The Sovereign (New Clanricard) is being developed. The 91 tons recently forwarded from this mine to Aldershot yielded 3 ozs. gold and 5% copper per ton.—Notwithstanding the drawbacks experienced at the Dee placer rush, owing to the want of water and the consequent stoppage of cradling, the output of alluvial for the month aggregated 467 ozs., to which total Crawford and party contributed 195 ozs., Cato & Townsend 118 ozs., Sutherland 29 ozs., and Nunn and party 28 ozs. A good many claims within the big nugget area have yet a considerable quantity of ground to test, but a number are nearly worked out, and unless something new is found in the meantime the number of men at present working is sure to decrease during the next few months.

#### Western Australia.

(Special Correspondence).—The Tower Hill Gold Mines at Leonora, in the Malcolm district, has a 40-stamp mill and filter press cyanide plant. R. B. Lamb, formerly in charge of the Westralia Waihi Gold Mines at Davyhurst, is superintendent. Kalgoorlie, Dec. 15.

The report of the Department of Mines of Western Australia for 1903 shows the total mineral output to be worth £8,971,937. The gold output was 2,064,801 ounces, valued at £8,770,719; 133,427 tons of coal were raised, valued at £69,128; 817 tons of block tin, valued at £55,890; 20,526 tons of copper ore, valued at £36,541; 168,113 ounces of fine silver. The dividends paid during the year amounted to £2,024,152. The number of men engaged in gold mining was 20,716; the value of gold produced per man was £423.37.

#### BRITISH COLUMBIA.

The Fort Steele Prospector estimates mineral production of British Columbia in 1904 as follows:

	Ounces.	Value.
Gold .....	313,185	\$6,264,000
Silver .....	3,505,805	1,898,000
	Pounds.	
Copper .....	36,684,580	4,540,000
Lead .....	37,000,000	1,415,000
	Tons.	
Coal .....	1,668,000	5,004,000
Coke .....	272,400	1,362,000

The approximate mineral output of British Columbia for 1904 is as follows:

Gold .....	\$ 6,400,000
Silver .....	2,200,000
Copper .....	4,600,000
Lead .....	1,500,000
Miscellaneous .....	600,000
Total mineral production other than coal .....	\$15,300,000
Coal and coke .....	4,470,000
Total .....	\$19,770,000

#### Boundary District.

Rich ore has been struck in the Paymaster fraction, near Midway, by G. R. Naden. — There are fifty men working the mines on the West Fork. The shippers are the Sally and Rambler. The Carmi stamp mill is in operation. — After a brief shut down, owing to lack of electrical power, the second furnace at the B. C. Copper Co.'s smelter has been blown in.

The British Columbia Copper Co. at Greenwood has its briquetting plant completed and is reducing its \$100,000 dust pile. They have placed a pumping plant on the artificial lake back of the smelter, created by damming the water of Copper creek with hot slag. This, in connection with its large steam plant, will always constitute a reserve power in case of emergency arising from failure of electric power.

T. H. Rea, superintendent of the Hesperus Gold-Copper Mines Co., says that the company has put in a 5-drill straight line air compressor and has spent about \$10,000 in improvements, including hoarding and bunk houses at the mine on Fourth of July creek, 3 miles from Grand Forks. The tracks of the Great Northern extension to Phoenix are within 1500 feet of the mine, with which it is connected by a good wagon road. A new working tunnel, down the hill to strike the ore body 275 feet deep, is in 250 feet and ore has been encountered.—The Granby smelter is running five furnaces and treating over 10,000 tons a week.

The Granby Con. M., S. & P. Co. intend to put in two more blast furnaces. The Granby smelter has six furnaces at present and is smelting 50,000 tons of ore per month. These six furnaces are all 160x42 inches at the tuyeres. The two new furnaces are to be 207 inches long and 48 inches wide at the tuyeres. This will bring the smelter capacity up to 70,000 or 75,000 tons per month and will increase the copper production. The entire smelting system is being remodeled on a new plan introduced and tried by General Superintendent A. B. W. Hodges. The furnaces will be charged by an automatic charging car, which will take the ore direct from the ore bins and place it in the furnaces. The new furnaces and other equipment, including the blowers and motors and a large brick stack and extension for the flue chamber, will be ready by July 1. The converter plant is also being doubled.

#### Lardeau District.

The Eva mill at Camborne has been started. The plant contains a rock crusher, two 5-stamp batteries, 1000-pound stamps, sizers and four Frue vanners. Water

power under a 400-foot head from Pool creek is used to run the mill. A 4200-foot tramway carries the ore from mine to mill. It is reported that the Eva Gold Mines Co. will put in an air compressor.

#### Rossland District.

The Evening-Eureka group, near Rossland, is bonded to the Le Roi No. 2 M. Co., which is developing it. On the Evening a small compressor plant has been put in and a three-compartment shaft is being sunk. The three-compartment shaft on the Eureka has reached a depth of 165 feet, and sinking continues with three shifts and two machine drills. At the 160-foot station a cross-cut has been started.

#### Southeast Kootenay District.

The Sullivan M. Co. is having a 250-ton lead smelting furnace built at Marysville, making three furnaces in all. They are also building a 250 ton converter of the Haberlin type to reduce the amount of sulphur in Sullivan ore. The converter will be used as an experiment and, if satisfactory, another one will be installed. The Sullivan smelter is being fully equipped. F. D. Weeks has charge of the smelter. Water for power is flumed from Mark creek.

#### CANADA.

The report on the mining industry of Canada by the director of mines shows the total mineral products of the year to be worth \$12,870,593, and the wages paid amounted to \$4,222,386. Of the total value, \$7,628,018 represents products of the non-metallic class and \$5,242,575 metallic products. The total production of gold was 10,383 ounces, valued at \$188,036; the industry gave employment to 493 persons, who were paid in wages \$245,490. Including the cost of supplies it required an expenditure of almost \$2 to extract \$1 worth of ore. The same story is told of silver mining; the total quantity produced was 16,688 ounces, valued at \$8949, and the wages paid out, \$8000. The production of lead was still more unprofitable, although restricted. The amount mined was 25 tons, valued at \$1500, at a cost of \$5189. Copper and nickel properties on the whole gave excellent returns. The value of the products was \$3,215,794 and the wages paid aggregated \$872,302, leaving a large margin for supplies and a satisfactory profit. In the non-metallic class a good showing is made by petroleum and cement. The wages paid for the production of petroleum amounted to \$165,700, while the value of the product was \$1,586,674.

#### MEXICO.

The following statement shows the dividends paid by various Mexican mining companies during December, 1904: Dos Estrellas, \$90,000; Santa Maria de la Paz, \$72,000; Santa Gertrudis-Guadalupe, \$60,000; San Rafael, aviadoras, \$33,600; Real del Monte, \$25,540; Morias de Bajan, \$20,000; Soledad, aviada, \$19,200; Esmeralda, Matehuala, \$17,250; Hacienda La Union, \$15,000; Santa Maria de Guadalupe, \$12,500; Victoria, San Luis Potosi, \$12,500; Haciendas San Francisco, \$12,000; Carmen, Pachuca, \$11,000; San Rafael, aviada, \$9600; Sorpresa, aviada, \$4800; Hacienda B. de Medina, \$3000; Turquesa, preferred, \$750; total, \$419,010.

#### Chihuahua

The Rosario M. Co. of Guadalupe y Calvo will add forty stamps to its mill. J. A. Peahody of Fort Worth, Texas, is superintendent.

The stockholders of the Descubridora M. & D. Co. and the El Rayo M. Co., in the Las Azules district, near Parral, have decided to build a 100-ton plant as soon as experiments are completed showing the plant best suited to the treatment of the ore. G. J. McCarty of Minas Prietas, Sonora; R. I. Howitt and C. Crowell of Monterey; W. B. Cloete of London; H. Howitt of Canada and B. Peterson and J. F. Johnston of Parral are interested.

The Tecolotes mill of the Guggenheim Exploration Co. at Santa Barbara has resumed operations. Since closing down a year ago the arrangement of the power, tables, etc., has been changed.

#### Durango.

A preliminary survey is being run for a railway from Santiago Papasquiaro on the Tepichuacnes branch of the International railroad and San Andreas.

#### Guanajuato.

The Mitchell M. Co. has shipped to Acapulco, Mexico, materials for constructing a 250-ton smelting plant, at La Dicha, and will put in a larger plant. G. Mitchell is president of the company.

Mining machinery is to be bought for the Poder de Dios mine. J. E. Swain of the City of Mexico is interested.

#### Guanajuato.

The Guanajuato Con. M. & M. Co. is the largest now operating in the district. It has a 60-stamp mill and a number of cyanide tanks, and owns a controlling interest in the Carmen-Guanajuato Co. The Guanajuato M. and R. Co. has prepared plans for a custom mill which will also treat the ores of the company's property. The Guanajuato River M. Co. has machinery at work on the head of the Guanajuato river to recover the silver from the tailings which were dumped into it during the 300 years of the bonanza era of the district. Many small properties are waiting for the erection of custom mills to resume work.

#### Jalisco.

The manager of the Santo Domingo mine at Etzatlan is experimenting as to the best method of treating the ores and will put in a milling plant.—The Agua Blanca copper mine at Etzatlan is to be equipped with a concentrating plant. W. N. Cummings is manager; it is owned by the Dwight Furness Co. The vein carries argentiferous and auriferous copper ores and argentiferous lead ores.

#### Lower California.

J. B. Runk of Jacalitos, 50 miles north of Alamo, and J. P. Bull of San Jose, are working the Mai Maran mine at Jacalitos, and have sunk the shaft 55 feet and run a 60-foot drift. Additional machinery will be purchased.

#### Mexico.

The shaft work at the San Patricio mine at El Oro has stopped owing to the difficulties presented by a body of rock that has been encountered, and, apart from the pumping of the shaft, operations are suspended. Ma-

chinery for diamond drilling has been set up and drilling started. Manager F. J. Graham is in New York City.

#### Oaxaca.

The Compania Compradora y Beneficiadora de Metales, in which C. P. Mena and A. L. Charlot are part owners, will put up a 25-ton milling plant at Tlacolula.

#### Sonora.

(Special Correspondence).—On the Americus copper mine, adjoining the Sierra de Cobre property, near Cananea, a 200-foot shaft has been sunk and work has begun on a double-compartment shaft. — R. K. Clancy of Detroit, Mich., has purchased the Eva, El Eden, Serro Finobella and Cinco Senores mines, 50 miles from Cananea, in the Picacho district. — R. Templeton of Magdalena district has denounced 15 pertenencias in that section, upon which is a shaft 130 feet deep.—The Chimata mine, 150 miles south of Cananea, in the Huepac mountains, is owned largely by F. J. Toussaint of Wisconsin. — On La Plomosa property, 5 miles from Huepac, a large smelter is being built. R. Graham is superintendent. — The smelter being built on the Transvaal mine, near Arizpe, will begin operations July 1.

Cananea, Jan. 30.

The Dea Gold M. Co., L. Padres manager, is developing a gold mine 1 mile from La Colorada.

The Coast Line C. Co., with office at La Calera, Altar, Sonora, have put reduction machinery on the El Oro mine, east from Poza. J. T. Cave has been re-elected president, J. A. Elliott secretary and treasurer, and J. Henderson manager.

#### PHILIPPINE ISLANDS.

F. L. H. Kimball is putting up a Ridsdon bucket dredger on the gravel property of the Philippine M. Co. on Masbate island.—The Philippine G. M. P. & D. Co. is putting in a Hendy 10-stamp mill at Camp Robinson, 31 miles from Kias, Benguet. J. F. Kemp of Washington, D. C., is president, W. S. Gray of San Francisco, Cal., secretary and manager, and H. E. Robinson superintendent.

#### SOUTH AMERICA.

##### Bolivia.

T. Hooper reports to the British Consul at La Paz that the department of Oruro, on the Bolivian plateau, has produced silver ores since the Spanish conquest, and lately tin; the latter has assumed more importance. The principal silver mines are at Oruro and are worked by La Compania Minera de Oruro and La Compania Minera de San Jose. Oruro is connected with the port of Antofagasta by a railway 574 miles long. The ores are worked for silver and tin. A certain amount of oxidized ores from the near outcrops are worked for tin, but the bulk of the mineral comes from the sulphide zone and consists principally of a mixture of iron pyrites, antimonial minerals, tin oxide, varying quantities of the mineral andorite, or sunnite—a sulpho-antimonide of lead and silver, which, pure, contains over 10% of silver—and occasionally a little stannite and galena. These ores are sorted at the mines and then sent by rail to the reduction works. The Compania Minera de Oruro, at Machacamarca, has a 50-ton plant, 25 kiloms. from Oruro, where the ores are treated by hypsulphite lixiviation and the silver sulphide shipped to Europe. The tin oxide is taken out by concentration, raised to about 60% metallic tin and shipped to Europe. These ores come from the mines called Socavon de la Virgen and from those of the Compania Minera de Itos, controlled by the Compania Minera de Oruro. The ores from the San Jose mines, belonging to the Compania Minera de San Jose, are sent by rail to Poopo, 50 kiloms. from Oruro, where they are treated in the works of the Compania Beneficiadora de Poopo. The silver is extracted by lixiviation, but the tin is extracted and treated in water-jacket furnaces and sent away as bar. In the range of hills east of Poopo silver and tin are found and the Trinaeria mine is working now. The distinctive feature of the ore is a cylindrite or rylindrite, which assumes a peculiar cylindrical crystalline form, and contains antimony, lead, zinc, arsenic and silver, combined with sulphur. This ore contains as much as 3% silver, and, though found sparingly, is the mineral which mainly gives value to the ores. It is found associated with iron pyrites, zinchenide, a little tin and sometimes galena. These ores are treated by lixiviation and concentration in the Bella Vista works at Poopo. The other districts that produce tin, which, from this point of view, are more important than the above-mentioned places, are dealt with below. At Chualla Grande, 9 miles from Pazna on the Antofagasta Railway and 25 kiloms. from Oruro, the Avicaya, belonging to Abell & Co., the Tortoral mines and the Chunchu mines at Antequera send their concentrates, ranging from 65% to 73% metallic tin, to Europe. In the Huanuni district several enterprises are working tin lodes—the Huanuni Tin Co., T. Hermanos, A. Penny, J. Duncan and others. Lead, copper, zinc, bismuth, gold and antimony are found but are not worked.

#### Trade Treatises.

The Glohe Iron Works of Stockton, Cal., have issued an attractive description of the Truax automatic ore cars, in a well printed and nicely designed booklet. The text description is ably aided by good illustrations. A perusal of its pages gives an insight into the ease and speed with which ore and water can be handled.

Publication No. 117 of the Allis-Chalmers Co. of Milwaukee, Wis., describes their latest improvements in Gates rock and orebreaker. Style D is their most recent design for crushing from 2 to 200 tons per hour, and style F for laboratory crushing. Portable rock breaking plants are also illustrated. The fine halftones assist materially in aiding the argument of the text. The typographical appearance is well up to the high standard set by Allis-Chalmers' publications. The booklet contains valuable information to anyone interested in rock breaking.



## Personal.

W. H. KRITZER of San Francisco, Cal., is at Goldfield, Nev.

J. G. MATTES is manager of the Lucky Boy mine at Keystone, S. D.

A. H. GUNNELL has returned to Grants Pass, Or., from New York.

W. THOMPSON is manager for the Waterson gold mines at Ocampo, Mexico.

J. GROSS has been appointed superintendent of the Horseshoe mill at Terry, S. D.

THOMAS HARRIS, superintendent of the Keystone placers, near Telluride, Colo., is in Denver, Colo.

ALEXANDER VEITCH, superintendent of the Arizona Copper Co. at Clifton, Ariz., is in San Francisco, Cal.

N. W. PARLEE has left Rossland, B. C., to become superintendent of G. A. Longnecker's mine at Dillsburg, Pa.

H. SIMONS has been appointed superintendent of the Reforma mine and smelter at Campo Marado, Guerrero, Mexico.

A. R. WILFLEY of Denver, Colo., has returned there from an extended trip through Arizona and southern California.

E. B. VAN OSDEL has resigned as superintendent of the smelter of the Turk M. Co. at Deer Trail, Wash., and is in Seattle.

J. A. FARWELL, vice-president of the J. George Leyner Engineering Works Co., Denver, Colo., has returned there from Chicago, Ill.

J. F. KEATING, superintendent of the Butterfly-Terrible G. M. Co., near Ophir Loop, Colo., has returned there from Denver, Colo.

S. LEVY, of the Western Exploration Co., has succeeded A. E. Hyde, Jr., as manager of the Annie Laurie mine at Kimberley, Utah.

A. E. HYDE, Jr., has resigned as the manager of the Annie Laurie mine at Kimberley, Utah, and will develop his interests at Goldfield, Nev.

N. C. BONNEVIE, manager of the Denver Ore Testing & Sampling Co., Denver, Colo., has been in New York City and other Eastern points.

W. SAUNTRY, president of the Columbus Con. Co. at Deadwood, S. D., has been at the mines of the Yaqui Copper Co., in Sonora, Mexico.

L. D. SIVYER of Los Angeles, Cal., is engaged in professional examination of an ancient silver mine in Sonora, Mexico, for Michigan parties.

GEO. W. MYERS, Pacific coast representative of the Chrome Steel Works, has returned to San Francisco, Cal., from a business visit to southern California.

O. HENKEL, connected with the La Colorado M. Co., in Sonora, Mexico, has been made superintendent of the American M. Co., operating in Ecuador, South America.

J. J. MACDONALD has resigned as manager of the Seal of Gold M. Co. at Dale, San Bernardino county, Cal., to become general manager of the Mendoza Con. C. M. Co. at El Valle Perdido, Lower California, Mexico.

E. A. H. TAYS has resigned as manager of the mine and smelter of the Sociedad Minera y Fundidora at Maconi, Cadereyta, Queretaro, Mexico, to resume practice as consulting mining engineer at Fuerte, Sinaloa, Mexico.

J. E. HUBINGER, president, and F. D. Wetmore, a director, of the Arizona & Mexico C. Co., accompanied by W. E. Defty, engineer of the company, are visiting their property near Caborca, in the Altar district, Sonora, Mexico.

## Books Received.

"Forest Conditions in the Ahsaroka Division of the Yellowstone Forest Reserve, Montana," by J. B. Leiber, Professional Paper No. 29 of the United States Geological Survey.

"Report of the Department of Mines of Western Australia for 1903," gives a comprehensive statistical account of mining operations and production. As the government exercises control over the mines of Western Australia, the report contains much information not found in statistical American reports.

Bulletin No. 246 of the United States Geological Survey is entitled "Zinc and Lead Deposits of Northwestern Illinois, by H. F. Bain. It contains descriptions of the topography, geology and ore deposits of northwestern Illinois, with a discussion as to the origin of the deposits. The mines are found in Jo Daviess county, near Galena and Elizabeth, forming a portion of the upper Mississippi zinc and lead field, which lies mainly in Wisconsin, but includes parts of Illinois and Iowa. The region is one of unmetamorphosed, little disturbed, sedimentary rocks of Paleozoic age, and there are no igneous rocks in or near it. The ores are smithsonite, and zinc sulphide occurring in gash veins.

## Obituary.

O. C. BUCKBEE of San Francisco, superintendent of the Caylord mine, near Auburn, died of pneumonia January 28th at Auburn.

## Commercial Paragraphs.

ENGLEBACH & REYNOLDS MACHINE CO. have opened a machine shop at 1401 Blake street, Denver, Colo.

R. J. CORY, formerly manager of Allis-Chalmers Co.'s Denver branch, is now at 1750 California street, Denver, Colo.

L. M. WARD has been appointed manager of the Denver, Colo., office of the Crocker-Wheeler Co., at 525 Seventeenth St.

THE Wellman-Seaver-Morgan Co. of Akron and Cleveland, Ohio, and the Brown Hoist Co. of Cleveland, Ohio, have consolidated.

THE Mine & Smelter Supply Co., Denver, Colo., has appointed A. W. Sales their New York manager with offices at 42 Broadway, New York City.

THE Hydro-Carbon Manufacturing Co., Denver, Colo., W. Van R. Whitall, manager, will enlarge their plant for the manufacture of their brand of paints.

CLEMENT & STRANGE, engineers and contractors, have opened offices at 307 Dooly Block, Salt Lake City, Utah. The firm is composed of Harrison Clement, until recently with the Bingham Con. M. & S. Co. as mining and mechanical engineer, and V. P. Strange, consulting mining engineer and manager of properties in Goldfield, Nevada.

THE National Wood Pipe Co. of Los Angeles and San Francisco has made another shipment of 8-inch and 10-inch machine banded redwood water pipe to the Cananea Con. C. Co., Cananea, Sonora, Mexico, to supply concentrators Nos. 1 and 2 with water. This pipe is especially adapted for conveying water heavily charged with acids, minerals or alkalis.

THE S. H. Supply Co., Denver, report recent sales of a complete hoisting plant, with No. 7 Cameron sinking pump, to Old Mexico; a complete hoisting plant to Tin Cup, Colo., and a 10-stamp mill to Oregon. This company will shortly move their stock of mining machinery from Twenty-second and Larimer streets to Eighteenth and Lawrence streets, Denver, Colo.

BONNEVIE & LEE, managers of the Denver Ore Testing & Sampling Co., have dissolved partnership, E. A. Lee retiring. N. C. Bonnevie will have the management of the plant hereafter. The head office of the company will be retained at 527 Seventeenth street, Denver, Colo. The management expect to double the capacity of the testing works, corner Bryant and West Sixteenth avenue, Denver.

THE DeRemer Water Wheel Co., of Denver, has a contract with F. H. Sethman, Denver, Colorado, for six 32-inch DeRemer water wheels for Glenwood, Nevada. These six wheels will constitute two units of power of 350 H.P. each. Each battery will consist of three wheels on one shaft, and under an effective working head of 400 feet should develop a velocity of 600 revolutions per minute.

THE rock drill and air compressor trade was largely represented at a gathering of associates and friends of Mr. Geo. A. Howells at the office of the Rand Drill Co. in New York, January 5th—the occasion marking the twenty-fifth consecutive anniversary of Mr. Howell's connection with the company. During the afternoon Mr. Howells was presented with a handsome loving cup by the officials of the company.

THE Richards Rapid-Economy Stamp Mill Co., of San Francisco, Cal., has now in operation several of its 3-stamp mills which are reported as giving satisfaction. The manufacturers claim that they are crushing a much larger percentage of rock in twenty-four hours with the three stamps than is being done with an ordinary gravity 5-stamp battery, and with the use of less power, and exhibit testimonials of reputable mining men who have the mills in use.

THE Davenport Foundry & Machine Co., Davenport, Ia., report the following recent shipments: Slope haulage engine for Southwestern D. Co., Colgate, I. T.; two hoisting engines for Continental Coal Co., Nelsonville, O.; five sheave wheels to Minera de Penoles Co., Mapimi, Mexico; two 24x36 hoisting engines to Springfield Colliers Co., Springfield, Ill.; two 20x36 hoisting engines to Landis Mining Co., Landis, Pa.; two hoisting engines to Clover Leaf Coal Co., Dugger, Ind.

ON account of the similarity and conflict in names of other concerns, the Second-Hand Machinery Co., which was organized a short time since and consolidated the S. S. Machinery Co., Tom Crow Machinery Co. and Machinery Supply & Implement Co., have changed their firm name to the Great Western Machinery Co., with offices at 1626-1638 Blake street, Denver, Colo. The officers are: H. Stewart, president and treasurer; T. Crow, vice-president and superintendent; Morris Block, secretary; D. C. McNerny, general manager.

THE following is a list of "Hornsby-Akroyd" oil engines recently installed or being constructed by the De La Vergne Machine Co. of New York: U. S. Navy Department, Wireless Telegraph Station, two 50 H. P.; Indianapolis Pipe Line Co., Geneva, Ind., one 32 H. P.; Ohio Oil Co., Findly, Ohio, one 25 H. P.; C. M. Holbrook, Oil City, Pa., two 32 H. P.; The Charles Mills Supply Co., New York City, one 13 H. P., one 7 H. P.; E. C. Bumiller, Iquique, Chile, two 4 H. P.; Thirteenth Regiment Armory, Brooklyn, N. Y., one 20 H. P.; Honolulu Iron Works, one 32 H. P.; Balbach Smelting & Refining Co., Newark, N. J., one 50 H. P.; C. E. Hewitt & Co., New York City, one 125 H. P.; Boston Light-house Department, two 4 H. P.; Bristol Electric Light Co., Bristol, N. H., one 50 H. P.; Armour Car Lines, Chicago, Ill., two 125 H. P.; Thos. Stephens & Sons, Ltd., Albany, N. Y., one 16 H. P.; Remington Machine Co., Wilmington, Del., one 14 H. P.; Lighthouse Department, Tompkinsville, S. I., two 13 H. P.; Light-house Department, Milwaukee, Wis., four 16 H. P.; The Andrews-Doron Co., Los Angeles, Cal., one 50 H. P., two 125 H. P.

## Latest Market Reports.

SAN FRANCISCO, February 3, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 27½d (standard ounce, 925 fine); New York, bar silver, 60½c, refined (1000 fine); San Francisco, 60½c; Mexican dollars, 51c, San Francisco; 47½c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.50@15.50; Electrolytic, 1 to 3 casks, \$15.67½; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £67 17s 6d spot per ton.

The copper market remains firm, with a slightly higher price both in New York and London. Electrolytic is quoted at \$15.67½—the highest price since the recent rise commenced. It is said that producers are sold up close to their output and, in view of this fact, it is not likely that prices will be lower for a time.

LEAD.—New York, \$4.55; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$4.50, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 15s 6d long ton.

SPELTER.—New York, \$6.30; St. Louis, \$6.30; London, £24 15s 6d ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.65@30.00; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, 31½c, 32½@35c. London, £131 12s 6d spot.

PLATINUM.—San Francisco, crude, \$18.50 ½ oz.; New York, ingot, \$19.50 ½ Troy oz. Platinum ware, 75@82c ½ gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 ½ flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.25c.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., .04c.

NICKEL.—New York, 55@60c ½ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ½ lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.85@17.10; gray forge, \$16.85; San Francisco, bar, 3c ½ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$25.00@26.00; open heartb billets, \$25.00@26.00; San Francisco, bar, 7c to 12c ½ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½ c ½ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½ c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@25.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city ½ bbl.

CEMENT.—Imported, \$2.15@2.65 ½ bbl.; California, carload lots, \$2.10 f. o. h. at works; small lots, \$2.40 ½ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 8½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymho, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

OILS.—Linseed, hoiled, hbl., 55c; cs., 60c; raw, hbl., 53c; cs., 58c; Lucol oil, hoiled, hbl., 50c; cs., 55c; raw, hbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 19c; Astral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c; Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal, iron hbls., 18c; wooden hbls., 20c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, hulk, 16c; do., cs., 22½c; 80° Gasoline, hulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in hulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., hbl., 75c; cs., 80c; Neats-foot Oil, pure, hbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ½ set; 14 oz., 40s., 9½c.



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## Powder in Mines.

The disastrous results often attending the storing of large quantities of dynamite in mine workings has been again fearfully demonstrated at the North Kearsarge copper mine, one of the Osceola Consolidated Co.'s mines near Houghton, Mich., where on the 8th inst. a quantity of nitro powder, stated to be 10,000 pounds, which was stored in a magazine on the eighth level of the mine, was exploded in some unknown manner. Several miners were killed outright and others are supposed to have been suffocated by the deadly fumes resulting from the explosion, and which completely filled the mine workings. That portion of the mine in the vicinity of the explosion is a complete wreck. Number 3 shaft, near which the explosion occurred, is 2280 feet deep, opening a large area of rich ground. The workings connect with the Wolverine mine on the north, and this shaft is the third from end line. Forty machine drills are employed in this mine, and the amount of powder required daily is large, probably not less than 1000 pounds, as from 300 to 400 holes or more are drilled daily. This may, in a measure, be considered an excuse for carrying so large an amount of dynamite in the mine workings, particularly at this season of the year when the temperature is very low in the Lake region, and frozen dynamite is useless, though even more dangerous in thawing than it is at normal temperature. Still it seems that the large amount of powder required might have been distributed to several stations. But if it were in ten different places there would still be sufficient in each magazine to do serious damage to the mine in event of explosion. The most regrettable thing in



The Sandstorm Mine, Goldfield District, Nev. (See page 84.)

connection with this disaster is that the lives of at least five men, and possibly many more, were sacrificed. The man in charge of the powder magazine was instantly killed, and probably he was the only one who could have known the immediate cause of the explosion. The Osceola Company have been making extensive improvements on their large property and have one of the most valuable as well as one of the most thoroughly equipped and best managed properties in the Lake copper region, and it seems unfortunate that the danger ever present in the storage of such large amounts of dynamite in the mine workings should not have been appreciated, and a separate place provided for it at a distance from the workings, accessible to those only whose

duty it was to distribute the powder. It is a notorious fact that constant contact and familiarity in handling dynamite renders men careless, and it often seems that the larger the amount handled the more likely those handling it are to become careless. Undoubtedly this disaster will result in the enforcement of strict regulations concerning the storage and distribution of dynamite in underground mine workings, not only on Lake Superior, but throughout the world.

THE American Institute of Mining Engineers has made an innovation in the publication of advance sheets of papers written by its members. Hereafter these sheets will be issued in the form of a bi-monthly bulletin, bound in paper. The transactions are copyrighted, something which has never been heretofore done. The object in making this change is to take advantage of the postal laws, and thus reduce the cost of sending out the large volume of literature issued by the Institute.

ALTHOUGH the mining industry on the Rand in South Africa has been established for eighteen years, it is only within the past few months that an attempt has been made to crush the ores of the banket by any other means than stamps. Recently a vertical roller mill—similar in operation to the Chile mill—has been set in operation. How it will be received as a competitor to stamps, and what comparative record can be made with it, has not yet been determined.

COAL MINING COMPANIES almost universally employ steam for motive power, presumably because of its cheapness. The coal costing a minimum price. The Lackawanna Coal Co. at its Truesdale colliery at Wilkes-barre, Pa., is about to inaugurate an innovation by installing a water power plant to operate the machinery of its mine and breaker. Cost of power will be reduced 90%.



Tonopah, Nev., in January, 1905. (See page 84.)



Goldfield and Vicinity, Esmeralda County, Nev. (See page 84.)



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## State vs. Federal Mining Law.

In a recent suit in Nevada, Judge Hawley held that the law of Nevada requiring the recording of mining notices is not sound law and not necessary, as a locator can hold his claim by merely performing the annual assessment required by the Federal law, which the court considers to be the best evidence that the claim holder intends to comply with the law.

This decision is of unusual interest in view of that recently handed down by Justice Brewer of the United States Supreme Court, reference to which was made herein in the issue of February 4th, and in which Justice Brewer upholds the right of the several States to enact mining legislation, not conflicting with the laws of the United States. This was in a suit in Montana, in which the constitutional right of the State to make supplementary mining laws was questioned. The State of Nevada has a code of mining laws, and one of the provisions of this code is as follows: "Within ninety days of the date of posting the location notice upon the claim, the locator shall record his claim with the district recorder and the county recorder of the mining district or county in which such claim is situated by a location certificate, which must contain: First, the name of the lode or vein; second, the name of the locator or locators; third, the date of location and such description of the location of said claim, with reference to some natural object or permanent monument as will identify the claim; fourth, the number of lineal feet claimed in length along the course of the vein each way from the point of discovery, with a width on each side of the center of the vein, and the general course of the lode or vein as near as may be; fifth, the dimensions and location of the discovery shaft, or its equivalent, sunk upon the claim; sixth, the location and description of each corner, with the markings thereon. Any record of the location of a lode mining claim which shall not contain all the requirements named in this section shall be void. All records of lode or placer mining claims, mill sites or tunnel rights heretofore made by any recorder of any mining district or any county recorder are hereby declared to be valid and to have the same force and effect as records made in pursuance of the provisions of this act. And any such record or copy thereof, duly verified by a mining recorder, or duly certified by a county recorder, shall be prima facie evidence of the facts therein stated."

In this section of the State laws the requirements are plainly set forth and a penalty provided for non-compliance, for the law says that any claim not duly recorded as required by this law shall be void. The decision of Judge Hawley, that the Nevada law was not good law, was probably rendered prior to the decision of the Supreme Court, or without knowledge of that important decision.

## The Drainage Tunnel in Colorado.

It is stated that Colorado legislators contemplate new legislation on drainage tunnels, in which it is contemplated to make the driving of drainage tunnels possible in the face of minority opposition. It is proposed to establish drainage districts through the medium of the courts. When one-half of the property owners control or own one-third of the property, they may petition the courts to establish a "drainage district." Then the court is to appoint a commission to make an examination and render a report to the court. Both sides to the controversy will have a hearing before the court. If it is decided to form a district, it is done by authority of the court, and the cost of such drainage works as may be made is assessed to all the property benefited by the tunnel. The value of drainage tunnels cannot be disputed, but the attempt to make a law of this character is new in mining legislation, though in particular cases, it seems reasonable that those who would derive benefit from such a tunnel should have some legal means of accomplishing their object in spite of opposition from a minority. The attempt to force a proposition through, however, is likely to result in strong opposition from those who do not care to share the expense, and before a law, such as contemplated will become of value it will have to stand the test of the courts, as all such legislation must. It is hopeful that the bill proposed will become a law and that those who realize the value of such a meas-

ure will be able to sustain it against any possible opposition. There doubtless are times when a mine in the vicinity of a tunnel would derive little apparent benefit from it, for geological or other reasons, and the assessment to such property would probably be entirely out of proportion to the possible benefits, but the proposed bill takes cognizance of such a possibility and provides for a proper adjustment of the matter by making such exception in favor of the mine in question as the committee of engineers may find proper and equitable. This phase of the bill should relieve it of strong opposition from any quarter.

## Important Supreme Court Decisions.

The United States Supreme Court has recently rendered some decisions on mining law which are destined to have a marked effect upon the development of certain mining districts. One of the most important is in the case of the Creede Mining Co. v. Uintah Co., in which case the Supreme Court on January 29 affirmed the decision of the lower court, and held the following propositions:

(1) A patent to a lode is not conclusive as to the date of its location, except that owners of surface conflicts who have failed to adverse, are therefore adjudged to be junior to the patented lode.

(2) Prior to patent a lode claimant has a vested right only in the surface and the vein apexing therein, and therefore a tunnel claimant prior to patent of the lode may run underneath the surface of the lode claim.

(3) A tunnel claimant who has not discovered a lode is not required to adverse a lode application, but may after patent show that the tunnel site was prior in date to the lode claim.

The courts have repeatedly held that one claim holder may not pass through nor enter within the lines of an adjoining claim for any purpose whatever, except in the pursuit of the vein on its dip. In the above ruling the United States Supreme Court now makes a distinction between patented and unpatented mineral claims, and says a tunnel claimant may enter and run beneath the surface of a contiguous locator, prior to patent. If this doctrine were advanced by a lower court a reversal would naturally be anticipated, but when a decision issues from the Supreme Court of the United States, there is no appeal to a higher tribunal. The full text of the decision in the above case is not yet at hand, and the theory of the stand taken by the court is not known, but in many regions where tunnel cases have been numerous, the decision will create astonishment, and may alter the trend of subsequent events in mine development.

CONGRESS has taken about 7000 square miles from northern Arizona and added it to Utah, all that remains to complete the transaction being the signature of the President. The territory in question is all that portion of Arizona in Mohave and Coconino counties lying north and west of the Colorado river. The Grand and Marble canyons form a commercially impassable barrier between the country lying to the north of the river and that on the south, and it naturally attaches to Utah, although Arizona's citizens vigorously objected when an attempt was made to annex this section to Utah two years ago. In the present instance it seems to have been an oversight in the statehood bill in which Arizona and New Mexico are concerned. There is little mineral wealth developed in the section in question, there being some copper ore deposits of a superficial character in the Permian formation and some iron in the area. It is for most part heavily timbered and springs of water are comparatively abundant. It will become a valuable addition to Utah, though, under the peculiar conditions attending the transfer, costing Utah nothing.

THE desert region of California has thus far not offered much inducement to practical oil men, as neither the geological nor commercial conditions are favorable; but, notwithstanding this, thousands of acres of these desert valleys and mountains are located as oil lands. Every outcrop of rock is either of volcanic origin or it belongs to crystalline schists, in which there is no possibility of finding oil, and yet derricks have been built and drilling outfits put in to bore for oil where no oil exists.

IN the Idaho Legislature an attempt was recently made to create an eight-hour day for miners, but the bill, through the influence of the miners themselves, was defeated. It was thought the passage of such a bill would result in destroying the present peaceful conditions, and that a cut in wages would be made should the bill become a law. It was believed to be good business policy to let well enough alone.

THERE are many things in the methods of working coal mines and in surface equipment which might be adopted with advantage by metal mines, where condition warrant it, but they are seldom seen in practice. There is more in common in the two classes of mining than is generally supposed by those who are familiar with only one or the other kind of mine. The drainage methods of coal mines in particular could, in many places, be applied in metal mines and effect marked economy, but metal miners are inclined to follow rather closely the practices and traditions of the past, and do not think of looking to coal miners for instruction or hints.

THE uncertainties which lie in the path of the leaser were fittingly illustrated in the experience of the leasers on the Gold Coin property in the Cripple Creek district recently. For months they had toiled earnestly in hope of rich reward, but struck nothing of importance until the last shift, when a round of holes opened up a vein of bonanza ore. The company gave the leasers three days in which to make what they could out of the strike. It is these uncertainties which lure the sanguine miner. He believes in his luck and is confident of his ability, and often he is willing to "take a chance" where there is nothing material to guide him other than his "nose for ore," and he goes after it, and fortunately for him in most instances he finds it, but in the case above cited, rather late. This will no doubt give the leasers confidence and they will be willing to try their fortune once more, hoping that the reward, which they deserve, will not be so long delayed next time.



## CONCENTRATES.

USE high-power explosive to break your rock flae and lessen the work of your rock crushers.

TOO HIGH a heat in cupellation will result in losses both from volatilization and from absorption.

SLAGS from the assay furnace should be kept out of the fuel, as they will soon destroy the furnace linings.

STAINS can be removed from marble switchboard panels by applying a mixture of chloroform, benzine and plaster of paris.

CRYSTALS of litharge form in cupellation between 625° C and 800° C. To avoid silver loss the cupelling temperature should be kept within these limits.

IN sampling a mine, samples should be taken at intervals of not less than 10 feet, and where values are high and somewhat erratic at every 5 feet, with duplicates of each.

ONE HORSE POWER should be derived from each mine's inch under a pressure of about 485 feet, if the pipe line is over 10 inches diameter and not over 1 mile in length.

TAILINGS may be lifted a distance of several feet by means of a jet of water under pressure—a modification of the hydraulic elevator. The principle in each case is the same.

THE purchase of any mining machinery carries with it the right to repair such machinery and replace the worn parts until the essential original parts have disappeared.

STEAM STAMPS of the type in use at the Lake Superior copper mines have been changed from year to year. Twenty-five years ago the maximum capacity was 125 tons daily; now it is 500 tons or more.

THE Alaska-Treadwell mine crushes about 2600 tons of ore daily. About one-half of the values are obtained in the form of amalgam and the other half as concentrates, which constitute 2.3% of the ore.

STEAM SHOVELS are extensively used in the open pits of iron mines in Minnesota and Michigan, and recently they have been introduced in several gold and copper mines, underground, in Australia and British Columbia.

IF the compressor valves refuse to operate, it is probably due to the formation of some gummy substance. Use kerosene, turn the valves a few times by hand and the trouble is usually at an end. If not, call a machinist.

ALL efforts to introduce silica to converter charges by other means than that derived from the linings has proved futile. Pulverized quartz has been fed with the matte, and the sand came to the surface and floated on the molten metal.

IN coal mines the regulations usually require that not less than 100 cubic feet of fresh air per minute be blown into the mine for each man employed in the underground workings. In metal mines the amount necessary is usually much less than this.

A PHENOCRYST is a large well-formed crystal of any mineral which appears in the mass of a rock. The size is relative—thus a fairly coarse granite may develop large individual crystals of feldspar (phenocrysts). The rock is then granite porphyry.

CYANIDE OF POTASSIUM undoubtedly hardens copper amalgamated plates, but it also renders the mercury bright and active, and where the gold is susceptible to amalgamation good results should follow its use where it is necessary to crush in the battery.

TO GLAZE a crucible so that it will not absorb silver chloride or other substances, fill it with a boiling saturated solution of borax, let stand a few minutes, pour out and set the crucible aside to dry. This will also prevent metallic particles from adhering to it.

THE speed at which it is safe to hoist in shafts is limited only by the power of the engine, strength of the rope and condition of the shaft. The fastest winding is probably at the Kimberley diamond mines in South Africa and at some of the mines of Butte, Mont.

IN shaft sinking as many machine drills may be employed at one time as can be conveniently accommodated at the bottom of the shaft. It is not uncommon for two machines to be set on one bar. Often conditions are such that one chuck tender can attend to two drills.

A VENTILATING FAN provided with a by-pass system of piping and the necessary gates may be employed as either a blower or an exhaust fan. After shooting in the mine the fan should be run as an exhaust, which quickly removes the nitrous oxide and other gases,

when the air current may be reversed by a proper manipulation of the gates and fresh air blown into the mine workings. When this is done men may return in a few minutes to the face where the blasting has been done, without danger of inhaling powder gas.

WHEN drifting through ground that stands fairly well, but which gives indication of caving later, all spaces above the timbers and at the sides should be promptly filled as the work proceeds, as, if left until the ground caves, it may loosen the timbers and cause collapse.

ELECTRICITY is being employed constantly to a greater extent in mining and metallurgy. It is now being used to reduce iron ores. It is wholly employed in the manufacture of carborundum, and as a means of power electricity is finding a continually widening field of application.

THE loss of head in a 14-inch pipe line, due to friction, for each 100 feet of its length, is estimated to be equal to 3.13 feet at a velocity of 10 feet per minute. In an 18-inch pipe the loss, with the same velocity, is 2.14 feet for each 100 feet of line. The friction increases with the velocity of the stream.

THE cost of drilling artesian and oil wells varies greatly, depending upon the character of the formation through which the bore is driven. The price per foot ranges from \$1 to \$10 under ordinary conditions, depending on the size of the bore. Where great difficulties are encountered the cost will be higher.

FORMERLY double cone-shaped reels for hoisting engines were usually made with the smaller ends adjacent. Now the reverse is the case, the larger ends abutting, and usually the reel is a unit, though made in sections. The reason for this change is that it permits a better method of bracing and strengthening the reel.

TALC, pyrophyllite and serpentine greatly resemble each other and are sometimes difficult to distinguish from one another. Serpentine may be distinguished from talc or pyrophyllite (a variety of talc) by its complete decomposition in sulphuric acid; pyrophyllite is only partly decomposed by it and talc not at all.

THE main objection to breaking ore by calcining and quenching is the tendency to slime. This is some instances is no longer an objection, as there is a growing tendency to slime before cyaniding. It is a process often resorted to where rock is to be crushed in an arrastra, as it pulverizes more readily and amalgamates better.

THERE is no accurate method for the rapid determination of gold in cyanide solution that does not involve a fire assay. The most reliable and accurate method is the evaporation of 291.66 c.c. of solution and 20 to 50 gms. of litharge to dryness, and the subsequent crucible assay with a suitable flux. This method also determines the silver present.

A FLUME may be built on a much heavier grade than is usually given ditches, because of the tendency of the latter to cut on heavy grades, and a flume may also be built on a much lighter grade than a ditch to carry a given amount of water, because of the lesser amount of friction in the flume. Flumes, however, will average a heavier grade than ditches.

TIMBERS decay very slowly under water. Where the shaft has caved under water it will probably be found due to the fact that the lagging had decayed before the mine was flooded, and the pressure of the rock caused it to give way, when the rock, continuing to cave, removed the support from the main shaft sets and the entire framework of timbers caved in to the shaft.

THE Wolverine copper mine near Houghton, Mich., is one of the few large mines in the world where no timbers are used and so large a percentage of the ore recovered. The main stope is 1000 feet wide, 400 to 500 feet high (on the dip). The thickness varies somewhat. No filling is done, but the walls stand, with only a few scattering pillars to hold it. The angle of dip is about 40°.

IN ascertaining the head of water under which an orifice is discharging, measure from the surface of the water to the center of the orifice. This was the original idea of measuring the miner's inch of water; but, as the head was not uniform in the several districts, the Legislatures have adopted 1.5 cubic foot of water per minute as a standard miner's inch. This is 11.35 gallons per minute.

BOILER EXPLOSIONS are due to a number of causes—overpressure, defective plates, low water and suddenly introducing a quantity of cold water, and a faulty safety valve which fails to operate. These and other causes are responsible for boiler explosions. The cause can only be ascertained in most instances after the explosion, when it is not always possible to be sure of the cause.

THE two deepest vertical shafts in America are the Tamarack No. 5 shaft of the Tamarack Co. (4938 feet) and the Red Jacket shaft of the Calumet & Hecla Co. (4920 feet), in the Lake Superior copper region. The deepest vertical shaft in California is at the Kenaedy mine, near Jackson, in Amador county. It is 2700 feet deep, with a sump, and is soon to be sunk to 2850 feet.

There are several inclined shafts in California over 3000 feet deep, in the Grass Valley region, and the main shaft of the Congress mine, Yavapai county, Ariz., is over 3000 feet deep on the incline.

A TUNNEL is sometimes readily ventilated by merely placing a ventilating pipe along the roof and carrying the outer end to an elevation of several feet above the pipe at the inner end of the tunnel. The ventilation can be improved by connecting the outside pipe with a furnace or providing it with a wind sail. A water blast, when available, is also effective. The two latter schemes apply to shafts as well as to tunnels.

THE circular saws used in the timber framing shop may be run at a higher speed than flywheels of the same diameter. A 20-inch diameter saw may be run at a speed of 1900 revolutions per minute and a 32-inch saw at 1200 revolutions. A large saw, 60 inches diameter, should not run over 600 revolutions per minute. Some sawmill men believe a rim speed for circular saws of 10,000 feet per minute is not too great.

"CONCENTRATES" at this time has no knowledge of any one treating "black sand" by the cyanide process. It seems reasonable to expect that gold may be extracted from auriferous black sands if they be ground fine enough to render the gold subject to the attack of the solution. It is doubtful if a high percentage could be extracted without gridding, as the grains of iron would be impervious to the action of the solution.

CRUSHING ROLLS vary greatly both in diameter and width of face. The speed at which the rolls should be run cannot be predetermined, as this depends largely upon the character of the ore being crushed. There is much theoretical data upon the subject, but practical experience demonstrates that these formulas are not always dependable, and that because a set of rolls works well on one kind of ore is not a positive indication that they will do well at the same speed upon another ore.

THE gold-bearing lodes of the Kalgoorlie field, Western Australia, are very irregular as to size and value of the ore. In some places the lode splits up into two or more veins and in other places it is merely a lot of stringers and low grade. The vein sometimes swells to 30 feet or more and will carry average values of \$20 to \$35 per ton over the entire width. Near the surface of the Kalgoorlie mine, which below 300 feet was characterized by these features, the vein was 80 feet wide, averaging \$28 per ton.

THERE are 29,166 + ounces troy in one ton of 2000 pounds avoirdupois. Ores and base metals are weighed in pounds avoirdupois, gold and silver are weighed in ounces troy. The assay ton (A. T.) system was devised to avoid the tedious calculation necessary to find the number of ounces of gold or silver per ton of ore. One A. T. = 29,166 + milligrams or 29.166 grams, i. e., 1 milligram : 1 A. T. = 1 ounce troy : 1 ton av. Consequently the weight of a bead in milligrams is equal to the number of ounces troy per ton of ore.

THE difference in the value of mica for 1902 and 1903 was due to the closing down of the New Hampshire mines, also the majority of the mines in North Carolina. There were no mines in operation in New Hampshire in 1903 or 1904. The old Ruggles mine (which was formerly the greatest producer) being involved in litigation, was compelled to close down in 1900. In a mica mine it is difficult to give a definite figure as to how much plate mica it can produce, as there is a great variation in the production of each mine. A mine may produce a ton of plate mica with three men at work one month, while the next might not produce over 200 pounds.

WHEN designing a head frame for a shaft the position which the engine will occupy should be known in order that the direction of strain when hoisting may be determined. This resultant strain lies midway in the angle formed by the rope descending into the shaft from the sheave and that portion of the rope passing from the sheave to the drum of the hoist. The back braces of the head frame should be placed in such a position that this line of strain will fall just within the frame—between the back brace and the upright members supporting the sheave. The practice is to build with such heavy timbers that there is little danger of overturning or collapse, but by proper observance of the resultant strains expense in construction may be saved.

WHEN a shaft is sunk in the vein, or in the hanging wall near the vein, the mistake is often made of having too small a pillar of ore to support the shaft, with the result that a disastrous cave occurs. In a large ore body the pillar should extend not less than 50 feet beyond the shaft in both directions along the strike and across the entire width of the vein. It is not the danger of the pillar caving, but of the entire mass shifting, because of weakened support due to the removal of large quantities of ore from stopes adjacent to the shaft on several levels. In many cases it is desirable to leave a much larger pillar than that above suggested. The character of the vein material and of the walls, as well as the width of ground stoped, are the determining factors in making a decision on this point.



## Tonopah and Goldfield, and Their Rapid Development.\*

Written for the MINING AND SCIENTIFIC PRESS.

The rapid development of the new mining districts in Nye and Esmeralda counties in southern Nevada within the past four years is merely illustrative of the remaining possibilities of the present time. Many had entertained the idea that all the good mines had been discovered. That such is not the case is abundantly proven by the sudden rise of these new districts, in a region remote from railway facilities at the time of their discovery. When the first ore was found by J. L. Butler, in 1899, the nearest railroad station was at Sodaville, on the C. & C. railroad—60 miles across deep, desert sand, and little known water available in this distance. Within the time which has since elapsed, Tonopah has grown from an uninhabited desert valley to a town of nearly 5000 people, with many of the conveniences and even luxuries considered essential to comfortable existence in modern cities. The railroad has reached Tonopah, and already plans have been matured to extend it farther—to the newer camp of Goldfield. No mining district of the West has had more prompt and vigorous development than Tonopah. In many instances the mine equipment is modern and thoroughly up to date. Some of the properties had little or absolutely nothing "to go on" at the surface, except the geological indications, and, as the geology has come to be better understood, the prospecting has been conducted on more experienced lines and the probable extent of the payable possibilities greatly enlarged. At first there was a decided disposition to get as near the first discovery (the Mizpah) as possible, but the indications now are that there are other zones beyond the limits of the camp which deserve careful attention. When at a distance from the vein system which centers around the Tonopah Mining Company's property, of which the Mizpah is the principal mine, the prospector can be no longer guided by the probable strike and dip of those veins which have made Tonopah famous, particularly as much of the immediate vicinity is covered by a later deposit of andesite, or the desert wash. In such instances the miner goes back to first principles and looks for outcrops of mineral veins and ore deposits. Outcrops are not numerous, but such do occur. One of the accompanying illustrations shows the massive iron-stained outcrop of crushed and silicified andesite on one of the claims of the Archer group, 2 miles southeast of Tonopah. The Sierra Nevada Development Co. is opening this property, and have a shaft under way, and are also driving a tunnel. In the shaft values are reported.

The early prospectors in the Tonopah district soon appreciated the fact that to remain in that town and to carry their search no further would result in no good to themselves, and accordingly they pushed out in every direction—to Lone mountain and Gold mountain; to the old district of Reville, 50 miles east of Tonopah. Some went northward, toward Belmont, and new discoveries are reported in that direction. Others risked still more; and in the fall of 1902 two venturesome young prospectors, Stimler and Marsh, discovered gold on Columbia mountain and located the Sandstorm and Kendall mines. This section was at first called Grandpa district, but a few months later was renamed Goldfield. One of the accompanying engravings is from a photograph of Columbia mountain, a noted landmark in the Goldfield region. In the foreground is seen the local "brick yard," where numerous "adobe" bricks are drying in the sun. In the rear, and near the foot of the mountain, is the new town of Columbia, also called North Goldfield. Now it consists of a double row of irregularly distributed frame "shacks" and tents and tent houses, but if the mine development meets the anticipations of the miners, it is not too much to expect solid rows of substantial buildings, and the busy scenes of industry, which have so often been seen in the history of the West. One of the views on the front page is that of Goldfield, beyond which is Columbia.

The topography of the southern Nevada desert is well illustrated in this picture. The broad, nearly level valleys, and the low, rolling ridges or abrupt steep mountain slopes, are often without a vestige of vegetation from base to summit, while a tree is unknown in this wilderness in which the miners have built cities in a day. Another view on the front page is that of Tonopah as it appears to-day. These illustrations are from "Greater Nevada," a book recently issued by the Nevada Chamber of Commerce of Reno. Before Butler's fortuitous discovery, Tonopah was a waste of coarse sand and jagged rocks, among which grew the scattering clumps of gray sagebrush, with patches of sand between. A more uninviting land can scarcely be imagined, but even this land has its usefulness and value, as is now abundantly proven in the development of rich mines of gold and silver in this desert region. The sagebrush is seen everywhere in Nevada—and by some it is known as the Sagebrush State.

In the early days of the Comstock some one, who had an extravagant idea of the eternal fitness of

things, conceived the notion that the sagebrush, which grew so abundantly, must have some usefulness and that its mission must in some manner be connected with the vast mineral wealth of the State—that it could not be that its presence was merely a coincidence. This visionary person invented the "sagebrush tea" process for treating the ores of the Comstock, but, for some reason, he failed to make the process work successfully.

One of the first mines developed in the Goldfield district was the Sandstorm. Nothing, perhaps, better illustrates the disadvantages of opening a

in detail. One of the accompanying illustrations is that of the January mine.

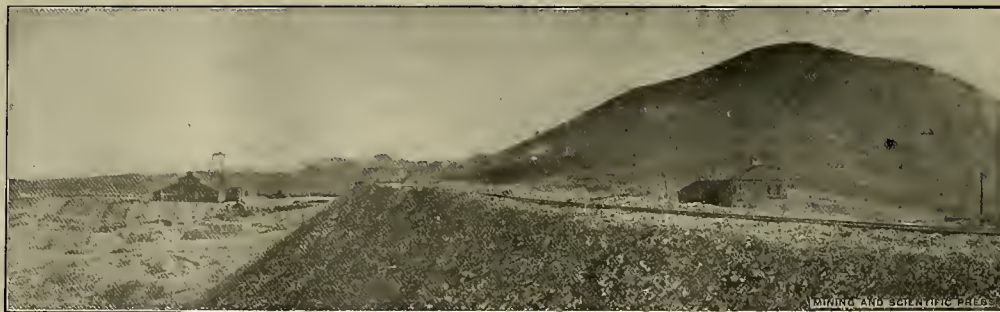
The Goldfield district is divided into several separate camps—Goldfield, Columbia and Diamondfield being the principal ones, though no one can tell how soon others may be added. The ores of this district are wholly unlike those of the Tonopah district. In the latter the ores, for most part, are firm and siliceous and present an appearance not unlike fine granular quartz ores elsewhere, but at Goldfield the ore is dense and flint-like, or soft and earthy, much of the latter resembling yellow silt (in which no gold



A Wayside Station on the Desert, Between Tonopah and Goldfield, Nev.



Tonopah Extension Dump and Mill, Tonopah, Nev.



The Mizpah Mine from Valley View Dump, Tonopah, Nev.—Mount Oddie on Right.



Columbia Mountain and North Goldfield, Nev.—Adobes in the Foreground.

mine in the desert than the engraving of this now noted mine, on the front page. The rugged, sharp rocks project from the low ridge upon which the mine is situated. Here and there is seen the grotesque yucca, the nearest approach to a tree to be found in days of travel in this region. The "blacksmith shop" occupies the foreground, and is a primitive affair—the two upright posts, with a cap on top, a bellows, and a pile of stones for a forge. The Sandstorm mine has passed this stage since the picture was taken and now has a better equipment. Other noted mines in the district are the January, Combination, Jumbo, Quartzite and Butte. Besides these are many others which it is needless to describe

is seen without a fine glass), and yet some of this extraordinary ore has contained more than \$100,000 in metallic gold per ton, while ore containing \$2000 to \$5000 per ton has not been uncommon in that camp. Hundreds of thousands of dollars worth have been shipped away in sacks, and some of the richest in boxes and sealed tin cans. Most of the mines are worked by the leasing system, and many of the richest deposits have been found by leasers lying exposed on the surface, or only a few feet beneath it, covered by sand or loose rocks and debris. Often shafts are sunk at random, and in some instances these ventures have been well rewarded by fortunate discoveries of pay ore, and pay rock in Goldfield district means ore

\* See illustrations on front page.



which will not go much below \$100 per ton—for transportation charges and other expenses incidental to ore shipment under the existing circumstances make high-grade ore a prerequisite to success and profit. These conditions will undoubtedly be improved this year, as mills are already being built in the district and much of the ore now considered low grade will be worked in them at a handsome profit.



Croppings on the Archer Group, 2 Miles S. E. of Tonopah, Nev.

One company in Goldfield district, the Sierra Nevada Development Co., which is also operating near Tonopah, is about to undertake a method of prospecting at Goldfield not yet tried in this region—that of sinking bore holes in what appear to be favorable places. This company has been sinking shafts and running crosscuts on several of their claims, near the Sandstorm, and on the Silver Pick, adjoining the January lease, they have a 110-foot shaft and will put in a steam hoist. Red Butte No. 1 lease is also being developed by them and, although J. D. Hoff of San Francisco, Cal., who is the manager,

## Calcium Sulphate in Portland Cement.

Written by R. K. MEADE and W. P. GANO.

If Portland cement clinker is ground just as it comes from the coolers, without the addition of any retarding substance, says the Chemical Engineer, the resulting cement is entirely too quick setting to allow

of its being properly worked. It is therefore the general practice to either grind a small percentage, usually 2% to 3%, of gypsum with the clinker or else to add to the cement just before it is shipped, a corresponding percentage of finely ground plaster of paris in order to regulate the set so as to give time for working, tamping and troweling. At some mills coarsely ground plaster of paris, or calcined plaster as the manufacturers call it, is added to the clinker before grinding.

Le Chatelier made many experiments on the effect of the addition of gypsum and plaster of paris to



The January Lease, Goldfield, Nev.

reports that good values have been opened up, on these claims no shipping ore has yet been found. Believing that prospecting can be more expeditiously and less expensively carried on by drilling holes systematically, this idea is now being put into execution by Mr. Hoff and, if successful, will no doubt do much to simplify the method of prospecting heretofore followed in these desert regions. The prospecting drill has been employed more or less extensively in testing gold-bearing gravel, but its application to the prospecting of quartz veins is somewhat of an innovation.

## Test of Air Lift Pumping Plant.

The Ingersoll-Sergeant Drill Co. reports the following results secured in a test made recently on a Pohle air lift pumping system installed in a southern brewery. The compressor furnishing air was an Ingersoll-Sergeant Class E machine, size 10x10 inches, and it was run at a speed of 100 revolutions per minute, corresponding to a piston displacement of 89 cubic feet of free air per minute. In this test the air and water pipes were lowered to a depth of 167 feet below the surface to clean out 33 feet of sand and dirt at the bottom of the casing, necessitating deep submergence, and accounts for the unusual air pressure required at the compressor. After the well is cleaned out, the pipes will be raised until a depth of 98 feet is reached, when an air pressure of forty or forty-five pounds will deliver the required quantity of water. The details of the test are as follows: Original depth of the well, 223 feet; depth of the well when the test was made, 183 feet; diameter of the well casing, 7½ inches; standing water level, 14 feet; drop in level when pumping, 21 feet; lift above the surface, 81 feet; total lift from lowest water level, when pumping, to the point of discharge, 44 feet; depth through which water and air pipes were lowered, 167 feet; submergence, 74%; quantity of water lifted, 264 gallons per minute; air pressure at starting, 68 pounds; working air pressure, 60 pounds; diameter of water discharge pipe, 3½ inches; diameter of air pipe, 1½ inch; horizontal distance from receiver to well, 246 feet.

NEVER has prospecting in the desert regions of California, Nevada and Utah been so active as now. This is due partly to the recent development of rich mines in Tonopah and Goldfield, and partly to the construction of the new railroad, much of the prospecting done in anticipation of cheaper transportation.

2H<sub>2</sub>O, containing 43.91% SO<sub>3</sub>.

The results are given in the tables below.

The first column shows the percentage of gypsum, etc., added to the cement. By percentage is not meant the percentage of gypsum in the mixture, but the percentage of the weight of cement in gypsum which is added. For instance, 2% means 2 grams of gypsum added to 100 grams of cement.

TABLE I.

Showing the Effect of Plaster of Paris on Setting Time of Cement.					
Percentage of Plaster of Paris Added.	Percentage of Water Used to Make Pats.	Initial Set.		Final Set.	
		Hours.	Minutes.	Hours.	Minutes.
0	25	0	2	0	6
0.0	23	0	5	0	10
1.0	23	0	50	4	0
1.5	23	2	50	6	0
2.0	22	3	0	6	15
3	22	1	45	5	20
4	22	0	35	4	0
5	22	0	16	2	0
10	22	0	16	1	30
20	22	0	9	0	20

TABLE II.

Showing the Effect of Gypsum on the Setting Time of Cement.

Percentage of Gypsum Added.	Percentage of Water Used to Make Pats.	Initial Set.		Final Set.	
		Hours.	Minutes.	Hours.	Minutes.
1	23	0	2	0	10
2	23	2	40	5	50
3	22	2	50	5	50
5	22	3	15	6	0
10	22	3	0	5	40
20	22	3	20	6	0

TABLE III.

Showing Effect of Dead Burned Gypsum on Setting Time of Cement.

Percentage of Dead Burned Gypsum Added.	Percentage of Water Used to Make Pats.	Initial Set.		Final Set.	
		Hours.	Minutes.	Hours.	Minutes.
1	23	0	6	0	10
2	23	1	45	5	50
3	23	1	47	5	30
5	23	2	0	5	40
10	23	1	50	5	0
20	23	2	20	5	0

TABLE IV.

Showing Effect of "Set" Plaster of Paris on Setting Time of Cement.

Percentage of "Set" Plaster of Paris Added.	Percentage of Water Used to Make Pats.	Initial Set.		Final Set.	
		Hours.	Minutes.	Hours.	Minutes.
1	23	0	8	0	40
2	23	1	45	5	0
3	23	2	0	5	20
4	23	1	45	6	0
5	23	1	55	5	35
6	23	2	15	5	50

The second column shows the percentage of water used for the pat, being the amount necessary to obtain a mortar of normal consistency as determined by the ball test. The third column shows the "initial set" or the time necessary for the cement to harden sufficiently to bear the light Gilmore wire ⅛ inch in diameter loaded with one-quarter pound. The fourth column shows the "final set" or the time necessary for the cement to harden sufficiently to bear heavy Gilmore wire ½ inch in diameter loaded with one pound.

While it is probable that a repetition of these tests upon other samples of cement would show quite a variation from the above figures, still the general facts given below will show in all of them, as we have found by checking the above on many samples of quick setting and unplastered cement.

Referring to the tables, it will be seen that there is little choice in the four forms of calcium sulphate so far as efficiency goes, all doing the work of retarding the set about equally well. This is to be expected. If the retardation is due to chemical action, there is no reason why any one of the forms should not be as efficient as the others because they all have approximately the same solubility, that of 1 part in 400 to 500 parts of cold water. The solution of any of the four would merely be one of a mixture of two kinds of ions, CaO, and SO<sub>3</sub>, and the SO<sub>3</sub> anions would be as free to react on the aluminates of lime if their source was gypsum as they would if they came from plaster of paris.

It will be noticed, by reference to Table I, that 2% plaster of paris produced the maximum retardation of the set. Larger quantities than this had the effect of quickening the set of the cement. This maximum, of course, varies with different cement, but with all it will be found that there is a point beyond which additions of plaster will be attended with shortening instead of further lengthening the setting time of the cement. The phenomena is, no doubt, due to the fact that plaster of paris itself is very quick setting. This explanation is strengthened by the fact that the addition of large quantities of calcium sulphate in the other three forms (see Tables II, III and IV), none of which have any setting properties of their own, does not cause any quickening of the set.

In view of the fact that both gypsum and set plaster of paris, which is merely plaster of paris reverted into gypsum, will slow the set of cement, there can be nothing in the theory that plaster loses its control, in time, over the cement, for the only change which the plaster can undergo is to absorb water from the air forming gypsum. We must, therefore, seek for another solution of the matter. Clifford Richardson suggested one in his paper on the "Constitution of Portland Cement," read before the Association of Cement Manufacturers at Atlanta City last June. His theory is that the tension in the solid solution of calcium silicates and aluminates which constitute cement, is released by changes in temperature, etc.,

Portland cement. He concluded that the governing action which it exercised over the cement was due to the formation of certain soluble compounds between the sulphuric acid of the calcium sulphates and the very active calcium aluminate of the cement which caused quick setting. He also stated that either gypsum or plaster of paris could be added to slow the set and that the addition could be made either before or after burning. Since, however, calcium sulphate is decomposed at temperatures decidedly below that at which Portland cement is burned there would be a decided disadvantage, owing to loss of SO<sub>3</sub>, in adding gypsum before burning. Indeed, from experiments made by one of the writers, if all the sulphur entering the kiln came out with the clinker as calcium sulphate there would be no need to add gypsum or plaster of paris.

In spite of Le Chatelier's experiments, it has been the theory generally held in this country that gypsum would not retard the set of cement, but that the only form of sulphate of lime which would do this is plaster of paris; that where gypsum is ground in with the clinker, this is transformed into plaster of paris, the heat generated during grinding being sufficient to drive off the water and makes the change from CaSO<sub>4</sub> · 2H<sub>2</sub>O to (CaSO<sub>4</sub>)<sub>2</sub> · H<sub>2</sub>O. It is true that in many cases the heat generated by the friction of the grinding machinery is sufficient to drive off the water, as the writer has frequently tested cement fresh from the tube mill and found it over 130° C, the temperature at which gypsum loses three-quarters of its water of crystallization. Indeed Shenstone and Cundall state that gypsum begins to lose its water of crystallization at 70° C in dry air.

The reason is also commonly given for the quickening of the set of some cements when fresh were of normal set, but which on storage had become quick setting, that the change was due to the reversion of the plaster of paris (CaSO<sub>4</sub>)<sub>2</sub> · H<sub>2</sub>O to gypsum or CaSO<sub>4</sub> · 2H<sub>2</sub>O. To test these various contrary theories and statements the writers carried out the following experiment:

A sample of cement was prepared by grinding fresh normal clinker in the usual way without the addition of any retarder. To separate portions of this were added in different percentages, finely ground:

1. Plaster of paris (CaSO<sub>4</sub>)<sub>2</sub> · H<sub>2</sub>O, containing 53.18% SO<sub>3</sub>.
2. Gypsum CaSO<sub>4</sub> · 2H<sub>2</sub>O, containing 44.32% SO<sub>3</sub>.
3. Dead burned gypsum CaSO<sub>4</sub>, containing 55.21% SO<sub>3</sub>.
4. Set plaster of paris, dried in open air CaSO<sub>4</sub>,



setting free some aluminate which makes the cement quick setting again.

It may be interesting to note that all of the above pats stood the boiling test, yet one of the newest books on cements (Falk "Cements, Mortars and Concretes") states that large percentages of plaster of paris cause cement to blow and expand.

We are aware that the above statements on the retarding of the setting time of Portland cement by gypsum will upset some of the theories of those who add plaster of paris to cement just before it is shipped. If it is properly mixed with the cements there are certainly points in favor of adding the sulphate here. We do not see, however, why finely ground gypsum would not do the work just as well, saving the cost of calcining. On the other hand, if the gypsum is added to the clinker, it is sure to be finely ground and thoroughly disseminated throughout the cement, two things necessary with any form of sulphate if it is to act as a retarder. There will be no danger of the gypsum failing to do its work, whether the temperature is low or high during grinding, and if the cement becomes quick setting on storage the blame cannot be laid to the gypsum. It must be remembered, however, that plaster of paris contains more sulphuric acid than gypsum, 290 parts of the former being equivalent to 344 for the latter, or a ratio of 87:100, so that plaster of paris, weight for weight, is the more effective of the two. Along this line dead burned gypsum is still more effective and should be cheaper than plaster calcined by the kettle process.

### Methods and Costs of Blasting and Handling Boulders.

One of the most important items of cost in hydraulic and placer mining generally, as well as in quartz mining, is that of handling boulders and the large rocks resulting from blasting. This is treated at some length in an article in the Engineering News, by D. J. Hauer, from which the following is abstracted:

The methods of handling boulders after they are broken up are by (1) steam shovels, (2) derricks, (3) cable ways, (4) sleds or lizards, (5) carts or cars, and (6) by wagons. \* \* \* Ordinary hand power, horse power and steam derricks can be used to advantage in hauling boulders, and in some classes of work money is frequently lost by contractors not providing themselves with the proper derricks. In borrow pits, on sidehill cuts on railroads and similar places, there is a ready use for different style derricks. No rule can be set down for styles and uses of derricks, but the conditions surrounding the work in hand must govern the selection of the derricks. To handle stone successfully with derricks, it is necessary to have several chains, sets of grabs and stone boats.

When only a few large boulders have to be handled from time to time, and loaded into a small dump car or wagon, a three-legged derrick and a triplex block can be used very economically. The derrick can be set up quickly over the boulder, and with the block the stone can be picked up and the car or wagon run under the suspended boulder and the load let down. This will be found less expensive than breaking the boulder up so it can be loaded by hand.

When a steam derrick has to be frequently moved short distances, it will be found expedient to mount both engine and derrick on a low, broad gage (10 feet) car, and move the car from place to place on a track, which can be built of wood. Uses for a car of this description can be found in both railroad and canal construction, and boulders weighing five tons can be handled.

In handling boulders with derricks, mud capping to break up boulders should never be resorted to, as there will always be time to do the necessary drilling to block the rock. At times the charge may be placed under the stone, but owing to the great chance of injuring the derrick by flying pieces of rock, this method of boulder breaking cannot be recommended under such circumstances. One mode of breaking up boulders when derricks are used is to raise up a heavy iron weight, and by tripping it, drop it on the stone to be broken. The weight is generally a ton. The writer has seen this method used to break metal around blast furnaces and stone in quarries, and as it is a money-saving device, its use could be much extended.

The most important feature in handling the boulders is the breaking of the larger masses into sizes which can be readily handled by the mechanical devices at hand.

**BREAKING UP BOULDERS.**—We now come to consider the different methods of breaking up boulders and the relative merits and costs of each. The following six methods can be used: (1) Boulders can be broken with plug and feathers, (2) by heating and pouring water on them, (3) by sledging, (4) by mud capping, (5) by blocking, and (6) by placing a charge of explosives under the boulders. Each of these modes has its uses and misuses, and it is hoped to point out a few of these, and give some cost data.

**PLUG AND FEATHERS.**—(1) Drilling the rock with a hand drill and then splitting with plugs and feathers is of great use, when the stone is to be used for building purposes, as for culverts and bridges. The cost of this work varies with the hardness of the

rock, the size to which the stone is to be broken and the price paid for such work. Good hand drillers are paid \$1.50 to \$3.50 per day, according to the locality. In the South negro hand drillers are paid \$1.50, while in some sections union stone cutters do this work for which union wages are paid. In soft sandstone a good hand driller can drill a hole 3 inches deep in 3 minutes, while in the harder sandstone and gneiss from 5 to 7 minutes will be necessary, and in the hardest granite 10 minutes may be consumed. These conditions make it difficult to give any idea of cost of breaking boulders by this method. When an air compressor is at hand this work can be cheapened by the use of pneumatic drills.

**THE HEATING OF BOULDERS.**—(2) The heating of boulders to facilitate their breaking has only a limited use from an economical and practical standpoint. No one would wish to use it in a railroad cut and similar places, but there are times when it becomes both a time and money saver. In clearing a piece of timber and to grade streets through it, the land was covered with surface boulders of trap rock. It was necessary to burn the brush and top wood. Accordingly, the wood was piled in heaps around the boulders, and when the rocks were still hot, water was thrown over them, causing them to crack and break, necessitating but little work with a sledge and none with explosives. In this instance, as the wood had to be burned, the only cost was the putting on of water—certainly a great saving in money. This method can be recommended for similar uses, and especially for surface boulders of 4 cubic yards or less. Large boulders cannot be heated enough. Anyone trying this method for the first time should be warned against small pieces of rock popping off when the water is poured on. This was found to happen now and then with trap rock.

The boulder must be heated thoroughly before pouring the water upon it, to insure breaking, for when only partly heated the surface only spalls off.

**SLEDGING.**—(3) Under a competent and watchful foreman many large-size boulders can be broken up with a stout sledge and gad, saving the use of explosives. A common laborer, as a rule, knows nothing of the rift of a stone and cares but little to learn. He usually begins hammering upon the face that the stone presents to the position that he happens to occupy, and unless the foreman interferes, he will waste time. Upon one occasion the writer watched a man use up 10 minutes in this manner, and after the foreman and man were shown where to direct the blows, the rock was broken up so it could be conveniently handled in less than 2 minutes. Frequently the use of the sledge prevents other men from working, and at times men will stop to watch the operation (there seems to be something fascinating about it) unless the foreman is ever watchful. For these reasons sledging of boulders should be planned out carefully and it should be the constant endeavor to have it done when the use of the hammer will not interfere with other men.

By looking closely for seams and cracks and taking advantage of these, and at other times using the pean end of the hammer with the rift of the rock, many boulders containing 1 cubic yard or less can be quickly broken. At times to turn the stone and keep an air space beneath the rock will mean a great advantage in breaking the boulder. Unless the foreman is alert, the men will in most cases break up the stone too small, and will also use the pean end of the hammer, when the stone should be hit with the full face.

A gad will be found useful in connection with a sledge, as stones can at times be split cheaply with the help of gads, when it would take considerable time to make an impression upon them with only a hammer. It is necessary to have several different size gads and some water will be useful to wet the spot upon the stone where the gad is to be started. If good judgment is exercised in directing men in the use of sledge and gad, money can be saved in breaking up boulders with this method over all others. The following are some records of cost of breaking up boulders by sledging: (These figures do not include moving the pieces after the boulder is broken, but all the pieces could be easily banded. Wages paid were \$1.50 for a working day of 10 hours.)

1. Hard blue sandstone,  $7\frac{1}{2}$  cubic feet, 1 man 3 minutes makes a cost of  $\frac{1}{4}$  cent or 2.7 cents per cubic yard.

2. Blue sandstone,  $12\frac{1}{2}$  cubic feet, 1 man 5 minutes, 2 men 2 minutes, makes a cost of 21 cents or 4.86 cents per cubic yard.

3. Blue sandstone, 16 cubic feet, 1 man 3 minutes makes a cost of  $\frac{1}{4}$  cent or 1.25 cents per cubic yard.

4. Red sandstone (not so hard), 1 cubic yard, 3 men 10 minutes makes a cost of  $7\frac{1}{2}$  cents per cubic yard.

5. Blue sandstone, 12 cubic feet, 2 men 8 minutes makes a cost of 4 cents or 9 cents per cubic yard.

6. Red sandstone, 23 cubic feet, 3 men 5 minutes makes a cost of  $3\frac{3}{4}$  cents or 4.1 cents per cubic yard.

7. Red sandstone, 18 cubic feet, 1 man 4 minutes makes a cost of 1 cent or  $1\frac{1}{2}$  cents per cubic yard.

**MUD CAPPING.**—(4) Mud capping a boulder consists in placing a charge of dynamite, with a cap and piece of fuse inserted into the charge, upon the top of a boulder, and after covering the charge well with mud, exploding it. By the uniform force exerted by dynamite in all directions, the boulder is generally

broken up so that the pieces can be loaded and carried away. This work can, as a rule, be done so quickly that the method has come into universal favor among foremen, but the great objection to it is the almost prohibitory cost. On account of this great loss mud capping should be condemned, as upon most occasions cheaper methods can be used. The only reason that should ever commend it to the thoughtful contractor is the saving of time in preparing the shot. For this reason, in thorough cuts, mud capping may occasionally be resorted to, but in sidehill cuts and borrow pits, where the work of sledging and drilling will not interfere with the labor of the muckers, this method should under no circumstances be used. In solid rock excavations, especially in sidehill cuts, after the cut is once shot, the amount of explosives necessary to break up the material should be very small, as methods 3, 5 and 6 can be used almost exclusively, but any contractor who keeps an accurate account of explosives used at different places will find that frequently, owing to the fact that foremen will mud cap almost every boulder, the cost of breaking up boulders will oftentimes exceed the original cost of loosening the material.

To illustrate this point the following figures are given: In a large tunnel approach a shot was made with thirty-six kegs of powder, the entire cost of explosives used for this blast being \$50.91. From this shot 1054 cubic yards of solid rock and 512 cubic yards of loose rock were excavated, and the cost of explosives used to break up the boulders so they could be handled was \$90.54, there being over 750 pounds of 40% dynamite consumed. The foreman in charge of this cut was considered a capable man, and each month showed a profit on his work. He nearly always mud capped his boulders, and as shown above, he certainly used too much dynamite. He could have made a large profit by using better judgment in breaking boulders. In this example no blocking was necessary to trim up the sides or bottom of the cut, as the work was being done in two lifts and this shot was made on the upper lift.

1. Upon another occasion, after a heavy blast was made in a thorough cut, a large sandstone boulder measuring 17 cubic yards was thrown upon some loose material across the cut, preventing the crew of ten men from working until it was broken up. To block it, two holes would have been necessary, and on account of the loose material under the rock it was not advisable to put the charge there. Accordingly, at a cost in labor of 30 cents, and 21 pounds of dynamite at 13 cents per pound and two electrical fuses costing 9 cents—making a total cost of explosives of \$2.82—the stone was broken up successfully and the work went on. This was accomplished at a cost of 18.6 cents per cubic yard, and may be considered as one of the few cases where this method can be recommended.

The following are some additional records of costs of mud capping. Labor was paid \$1.50 per day of 10 hours, 40% dynamite cost 10 cents per pound, caps 60 cents per hundred and fuse 42 cents per hundred feet:

2. Red sandstone, 1.6 cubic yard, labor 8 cents, dynamite 20 cents, cap and fuse 2 cents—total cost 30 cents, or nearly 18 cents per cubic yard.

3. Red sandstone, 1 cubic yard, labor 8 cents, dynamite 15 cents, cap and fuse 10 cents—total cost 25 cents.

4. Two red sandstone boulders same size,  $\frac{1}{4}$  cubic yard, and same cost as follows: Labor 8 cents, dynamite 10 cents, cap and fuse 2 cents—total cost 20 cents or  $26\frac{2}{3}$  cents per cubic yard.

5. Hard blue sandstone, 1 cubic yard, round boulder, labor 8 cents, dynamite 15 cents, cap and fuse 2 cents—total cost 25 cents. This blast did not even crack the boulder and it was shot a second time, labor being 11 cents, dynamite 10 cents and cap and fuse 2 cents—making a total cost per cubic yard for the two blasts of 48 cents. The second shot cracked the boulder, and it was still necessary to use a sledge and gad on it, at a cost of 3 cents. Total cost 51 cents.

6. Blue sandstone, 1.2 cubic yard, labor 8 cents, dynamite 20 cents, cap and fuse 2 cents—total cost 30 cents, or 25 cents per cubic yard. This broke the boulder, but a part of it had to be sledged at a cost of 5 cents.

**BLOCKING.**—(5) The blocking of boulders is a much cheaper way of breaking them up than mud capping. It should always be used in preference to that method, except when too much time will be consumed by a crew of men waiting for the drilling to be done, as shown in example of cost No. 1 (as given under mud capping). Under such circumstances the time consumed would be a greater cost to the contractor than the extra amount of dynamite. Then, too, on large, thin boulders, to drill one hole would result only in breaking the stone into such pieces as would again have to be broken—and the many holes might equal the cost of extra dynamite. Under such circumstances if this method (6) cannot be used, mud capping will have to be resorted to, to do the work economically.

A hole properly charged and covered with mud will effect a saving of 60% to 70% of dynamite, over mud capping. The bottom of cuts should always be blocked, as this sort of work can always be planned ahead, and it is the only way a shallow rock bottom



can be taken up accurately and at a minimum cost. Of course machine drills on this class of work will save money over hammers and drills. Surface boulders, where it is not possible to use method (6), should always be blocked. Occasionally on very large surface boulders black powder can be used, but as a rule dynamite will be given the preference unless it is desired to use the stone for building purposes, when engineers will forbid the use of dynamite. This has ever been done in some cases where the stone is to be used for concrete.

In the following examples of costs the prices were the same as those named under mud capping:

1. Red sandstone boulder, 13 cubic yards, broken up entirely.

Drilling 3-foot hole, at 25 cents per foot	.....	\$ 1 05
Dynamite	.....	0 20
Cap and fuse	.....	0 02
Labor	.....	0 18
Total	.....	\$ 1 45
Cost, per cubic yard, 11.1 cents.		

2. Blue sandstone, 3 cubic yards, broken up entirely.

Drilling, 1-foot hole	.....	\$ 0 40
Dynamite	.....	0 10
Cap and fuse	.....	0 02
Labor	.....	0 08
Total	.....	\$ 0 60
Cost, per cubic yard, 20 cents.		

3. Red sandstone, 4½ cubic yards, broken up entirely.

Drilling, 1½ foot	.....	\$ 0 52
Dynamite	.....	0 12
Cap and fuse	.....	0 02
Labor	.....	0 10
Total	.....	\$ 0 76
Cost, per cubic yard, 16.9 cents.		

4. Blue sandstone, 2½ cubic yards, entirely broken up.

Drilling 1-foot hole	.....	\$ 0 30
Dynamite	.....	0 05
Cap and fuse	.....	0 02
Labor	.....	0 05
Total	.....	\$ 0 45
Cost, per cubic yard, 18 cents.		

5. Blue sandstone, 2 cubic yards, entirely broken up.

Drilling, 7-inch hole	.....	\$ 0 20
Dynamite	.....	0 10
Cap and fuse	.....	0 02
Labor	.....	0 04
Total	.....	\$ 0 36
Cost, per cubic yard, 18 cents.		

In all these cases boulders were broken up so that they could be loaded by hand. The item of labor is the time consumed by the crew of men in putting mud on the charge and leaving and returning to the cut. In case No. 1 this item is large, as that boulder was broken alone, but in the other cases a number were broken at one time. In case No. 3 but one other boulder was broken with it, so again this item is comparatively high.

**PLACING CHARGE UNDER BOULDER.**—(6) The method of placing the charge of dynamite under the boulder in order to break it has not been used extensively, and for this reason it is difficult to obtain costs of this method. That it can and should be used on account of its cheapness over other methods should commend it to contractors. The charge can easily be placed under the rock by either raising the boulder up with bars or levers, or churning a hole under it with a drill. In some cases the boulder can be turned over and the charge placed, as this is being done. At least 50% to 60% of the charge necessary to mud cap a boulder can be saved by this method and the work can be done as quickly. The rock, as a rule, will not only be broken up, but most of it will be thrown out of the cut. For this reason where there can be no waste of material, engineers may prohibit this method. Of course where the material that the boulder is lying on is soft, this method cannot be used successfully. Its greatest use will be found on hard rock bottoms, also in breaking up and moving surface boulders.

The following examples of costs are given for boulders broken off in this way.

1. A surface boulder, containing 50 cubic yards, was moved off the right of way at the following cost:

Four kegs of powder, at \$1.64	.....	\$ 6 56
Cap and fuse	.....	0 04
Dynamite, 2½ pounds, at 16 cents per pound	.....	0 40
Labor	.....	5 50
Total	.....	\$12 50
Cost, per cubic yard, 15 cents.		

The labor consisted of one foreman one day at \$3, two men at \$1 a day each and one boy a day at 50 cents. The entire boulder was moved a distance of at least 40 feet. The labor item was large, as it was necessary to carry a large amount of sand to be used in tamping the load well under the boulder.

2. A red sandstone boulder, 9 cubic yards, was completely blown away at the following cost: Labor 10 cents, dynamite 5½ cents, cap and fuse 2 cents—total cost 17½ cents; cost per cubic yard 1.94 cents. Labor in this case was \$1.35 per day and dynamite cost 11 cents per pound.

3. A large boulder sticking into the base of the slope of a cut had 1½ cubic yards shot off it by putting the charge under the projecting end. Labor 13 cents, dynamite 16½ cents, cap and fuse 2 cents—total cost 31½ cents; cost per cubic yard 21 cents.

About cubic yard was thrown out of the cut and the rest was broken up, so it could be handled.

Labor and dynamite cost the same as in case No. 2. The next case was blue sandstone and the boulders were entirely blown away. Labor was paid \$1.50 and dynamite cost 10 cents per pound.

4. Boulder, 1½ cubic yards, labor 9 cents, dynamite 8 cents, cap and fuse 2 cents—total cost 19 cents; cost per cubic yard 15.2 cents.

## Early Mining Laws and Locations.

Written for the MINING AND SCIENTIFIC PRESS.

The United States mining law is to a great extent based upon the early customs, rules and regulations of the miners of pioneer days. In the early days of California and Nevada there were few laws to guide the miner, and he from necessity created a code of laws, simple in themselves, but which were considered sufficient for the time being. As early as 1851 the California State Legislature passed a law which recognized the rules and regulations of the miners and declared that they might legally be offered as evidence in the controversies which might arise over the possession of mining claims or their operation, and that "these rules and regulations should govern the decision of the action when not in conflict with the constitution or laws of the State or of the United States." When in 1859 the Comstock was discovered the miners of Washoe followed the example of the California miners, and accordingly framed a code of regulations for their own government. The first code of mining laws adopted in Nevada was in part as follows:

**ARTICLE I.** There shall be elected one justice of the peace, one constable and one recorder of this district for the term of six months.

**ARTICLE IV.** The duty of the recorder shall be to keep in a well-bound book a record of all claims which may be presented for record, with the names of the parties locating or purchasing, the number of feet, where situated, and the date of location or purchase; also to return a certificate for such claim or claims.

**SECTION 7.** Evidence of record of claims shall be considered title in preference to claims that are not recorded; nor shall the recorder record more than one hill, dry gulch, or ravine claim in the name of an individual unless the same has been purchased.

**Sec. 8.** All claims shall be properly defined by a stake at each end of the claim, with the number of members forming said company and the number of feet owned.

**Sec. 9.** All claims shall be worked or the notice renewed in sixty days from the date of record, and no claim shall exceed 200 feet square, hill claims excepted, which may be reduced to 50 feet front.

**Sec. 10.** The recorder shall be allowed the sum of 25 cents for recording the claim of each individual, or member of a company.

**Sec. 11.** No Chinaman shall be allowed to hold a claim in this district.

**Sec. 12.** This district shall include all the territory from the meridian of Johnstown to Steamboat valley.

**Sec. 13.** All quartz claims shall not exceed 300 feet in length, including the depths and spurs.

**Sec. 14.** Any person discovering a quartz vein shall be entitled to an extra claim on all veins he or they may discover.

**Sec. 15.** All persons holding quartz claims shall actually work to the amount of \$15 to the share within ninety days from the time of locating.

**Sec. 16.** All persons holding quartz claims and complying with Section 15 shall hold the same for term of eighteen months as actual property.

**Sec. 17.** All quartz claims shall be duly recorded within thirty days from the time of locating.

**Sec. 18.** No person shall locate more than one claim or a vein discovered.

**Sec. 19.** Any and all persons locating for mining purposes shall have the same duly located within ten days from the time of locating.

**Sec. 20.** Resolved, That the above rules and regulations shall be signed by citizens of this district (Gold Hill), and all who may locate hereafter.

These "rules and regulations" are from the early records of the Gold Hill mining district. It is scarcely necessary to call attention to the conflicting provisions of several of the regulations and the uncertainty of the meaning of others. It is evident that such a code of laws could only result in conflict in a camp of rich mines, but these and similar rules and regulations in Nevada and California were the basis of the present mining law of the United States, and to a less extent of the several States also.

In the early days prospectors appeared to have a very crude idea of these laws, doubtless due to the fact that the laws were themselves crude. Even to-day prospectors write strange legends upon their location stakes. Some of the notices posted on early Comstock claims are among the most interesting of their kind, and readily explain why almost interminable litigation resulted in that district. Here are a few specimens of the remarkable conception of the early Comstocker of the mining rules as promulgated by the Gold Hill mining district:

### NOTICE.

That we the undersigned claim 600 feet of this quartz vein, commencing at the south end of James Cory claim and running south 600 feet and two claims.

LEE JAMES,  
JNO. MURPHY.

Another notice in the vicinity of this contained the following:

### NOTICE.

That I the undersigned claim—claim one claim on this quartz vein of 300 feet, commencing with the south end of Lee James & Co, and running south 300 feet to the line and one claim.

J. D. WINTERS.

Still another and more peculiar notice was the following:

### NOTICE.

That we the undersigned do claim 100 feet wide running up the hill 400 feet including quartz and surface from notice near a cedar stump. May 15, 1859. This claim lies south of Penrod and Comstock claim, Six-Mile canyon.

A. WHITE,  
JOS. CURBY,  
A. G. HANACK.

The next notice was on the ground near the last mentioned, and read as follows:

### NOTICE.

That we, the undersigned, do claim 500 feet, commencing at J. B. Winters' claim Running south including surface and quartz with all of it dippings, and angles, spurs.

F. B. ABERNATHIE,  
P. M. BALDWIN,  
E. BELCHER,  
R. D. SIDES.

These notices are of the greater interest from the fact that they cover a good portion of what afterward became the most renowned mine in the world—the Consolidated California & Virginia mine.

From the above it is clearly evident that the elements which now form the principal source of contention in mining litigation entered early into the history of mining in the West, and "dips, spurs and angles" were recognized from the beginning as forming in some indefinite way a portion of a vein system, and that the privilege of following them should be reserved to the locator, as well as the main vein which was the subject of location.

Although more than fifty years have passed since these early days, and the mining laws have become more or less familiar to all engaged in mining, prospectors still persist in making defective locations, referring their corners to objects not permanent, and exercising little care to see that there is no conflict with pre-existing rights. Oftener they fail to erect proper posts or monuments at the corners, or if they fail do not take the trouble to renew them. It is rarely that there is trouble or litigation over a valueless mine, but in the event of a valuable property being developed it is almost impossible to avoid a lawsuit if every detail of the requirements of the mining laws is not strictly complied with, and even when they are it is sometimes difficult to retain possession of a very valuable property without an expensive suit to establish rights gained by this faithful observance of the law. Often prospectors do not understand the law in reference to location of claims, and do strange and unnecessary things. One a few months ago read a description in a book "how to locate a mining claim," illustrated by a diagram. In locating a claim he gave the claim the name taken for the purpose of illustration in the book, and then at the point of discovery posted a notice bearing another name—the name he desired to give the location. He had both notices recorded in the office of the county recorder. This is merely a single instance of many wherein it is clearly evident the average prospector either does not understand the law, or is careless in following it. Some are intentionally so, believing that this laxity affords them an opportunity to amend the location later so as to gain some advantage when in possession of more definite knowledge as to the strike, dip, etc., of the vein, but an amended location cannot be made which will encroach upon the rights of others who have located since the original claim was taken up. If the outcrop dip and other physical features of the vein are obscure this is the misfortune of the locator, who must do the best he can under the circumstances, and if there is any excitement over locations in his vicinity, for self-protection he must do it quickly or he will lose his opportunity.

## THE PROSPECTOR.

The specimens from Holmes, Wyo., have been determined as follows: No. 1, principally lead carbonate in quartz, also a small amount of wulfenite (lead molybdate); there is also a small amount of copper present; the green spots are copper carbonate. No. 2 is granite, largely consisting of pink feldspar; the metallic scales on the granite are specular iron (hematite). No. 3 is a much altered granite, but different from No. 2; rocks containing as much iron oxide as No. 3 are sometimes gold bearing.

The rocks from Cave Creek, Ariz., are identified as follows: No. 1. Quartz in which is a little chalcocite (copper glance). The green color is due to a stain of copper carbonate. The percentage of copper present is small, but suggests the advisability of prospecting and development in the vicinity of its occurrence. The scattering seams and bunches may overlie a larger body of ore, but this it is impossible to tell, even when on the ground. No. 2 is quartz containing a large amount of epidote, the yellowish-



green mineral. A small amount of garnet is also present. The rock presents the appearance of having been altered from limestone and probably occurs near the contact of an eruptive mass. No. 3 is similar to No. 2, but contains more quartz and less epidote. No. 4 is also a much altered rock, difficult to determine, but presents more the appearance of an altered eruptive rock than one of sedimentary origin. In many of the copper mines of southeastern Arizona the surface showing is small, but this cannot always be depended upon, for in some instances a poor showing at the surface does not improve with depth, and again a fairly good showing at the surface grows poorer upon sinking and finally "peters out."

The rocks from Hedley, B. C., are as follows: The dark brown sample with white crystals scattered through it (number illegible) is diabase porphyrite; No. 2 is diorite somewhat altered. It contains considerable sulphide of iron and a little copper; No. 3 is grano-diorite in which is seen glistening iron sulphide; No. 4 is essentially all quartz, though evidently an altered eruptive rock, probably similar originally to No. 2. One sample (number illegible) is quartz in which is seen a large amount of galena (lead sulphide). The other three pieces are apparently diabase. The specimens were all too small and not protected from rubbing upon each other by separate wrappings.

Of the two rock specimens from Callahans, Cal., No. 1 is a granular quartz rock, apparently metamorphic, and occurring in kidneys or lenses in mica schist; occasionally rock of this character is gold-bearing, but the values are always spotted, though sometimes high grade. No. 2 is diorite aphanite, a basic, compact, flint-like intrusive rock breaking with conchoidal fracture; the specimen contains considerable pyrite in minute crystals disseminated through the mass.

The samples from Cerrillos, N. M., are: No. 1, a granite dike rock, containing large phenocrysts of soda-lime feldspar. The reddish color is due to iron oxide. No. 2 is granitic detritus, in a semi-cemented condition. The black material is largely carbon, which loses its color on burning. The white pebbles in this material are not crystals, but water-worn fragments of quartz and feldspar from granite.

The small rock fragments from Temascattepec, Mexico, are lava, in which are crystals of olivine, quartz and calcite. The pieces are too small for determination.

## The Mines of Cripple Creek, Colo.\*

NUMBER IV—CONCLUDED.

Written by W. LINDGREN and F. L. RANSOME.

There is in fact little indication of enrichment in the oxidized zone, such as is so often found in gold-quartz veins of the normal type. Frequently the fresh telluride ore is extremely rich, and high-grade pockets occur impartially in oxidized and fresh portions of the veins. Neither would it be correct to say that there is a gradual decrease in the value of ore in depth. It is quantity, not value, which decreases.

While it is certain that pyrite, and possibly other minerals, has formed at more than one period during the mineralization of the district, and while it is equally clear that in general the rich tellurides were the last of the ore minerals to be deposited, there is apparently no evidence that either one of these minerals has been formed by enriching solutions at the expense of primary minerals. So far as definite conclusion is warranted in an investigation as yet incomplete, it appears that the unoxidized ore deposits of the Cripple Creek district represent the product of one general period of mineralization and that they have not been appreciably modified by secondary enrichment during the subsequent erosion of the region.

**UNDERGROUND WATER.**—The conditions of underground waters are interesting and somewhat unusual. A dry climate and a heavy percentage of run-off minimize the annual additions to the underground supply. Nevertheless, the ground-water level is not unusually deep, and large quantities of water are encountered in all the mines below that level. The original water surface of the district in the volcanic rocks stood at elevations of 9400 to 9700 feet, or 100 to 600 feet below the surface of the ground. At first pumping was commenced at individual mines, but it was soon found that the radius of drainage had unusual length—that is, that one mine would drain others at a distance. Drainage tunnels were then undertaken, and the Chicago & Cripple Creek, the Ophelia, the Standard, and lately the El Paso, tunnels were driven, each of which practically accomplished the drainage of a large part of the district almost down to its own level, thus showing that the ground water is limited in quantity and is more of the nature of a local reservoir than a "subterranean sea."

The plug of volcanic rocks which fills the throat of the old volcano is rudely circular, with a diameter of 3 miles. This mass is extremely porous, and is, moreover, cut in many directions by partly filled fis-

tures and sheeted zones, so that water can circulate within it with comparative freedom in several directions. It retains this character down to the greatest depth yet reached. On the other hand, the surrounding granite is relatively impermeable and is less traversed by open fissures. No doubt it contains ground water down to a depth of 2000 feet or more, but in very much smaller quantity, and the circulation of this water must be extremely slow. This is clearly shown by the fact that the water in the breccia is not drained by Cripple creek and Arequa gulch below the level of the points where they leave the volcanic area. Thus the volcanic plug resembles a water-soaked sponge inserted in a hole cut in an impermeable substance. The drainage of the mines

investigations concerning this subject are not yet concluded. It may be said, however, that a sudden lowering of the barometer seems to be the most important factor. Upon such a fall the gas issues in great volumes, but decreases when the barometer remains steadily low for several days. The gas is often very heavy, filling lower parts of drifts and winzes like water, and cases are reported in which it has actually been bailed from a shaft. Its temperature is somewhat higher than that prevailing in the mine under normal conditions.

It has practically no smell or taste, but small quantities of it easily produce effects of suffocation. Miners working in places where this gas is mixed with the air soon experience various forms of physical



Head Frame and Bins of the Exposition Mining & Leasing Co., Cripple Creek, Colo.

is thereby greatly facilitated, as it is not necessary to extend the tapping tunnels to each mine.

The El Paso tunnel, completed in the winter of 1903-4, has an elevation of 8790 feet at the portal. Within a short time it effectually drained not only the Beacon hill mines but also the Gold hill mines, and its influence extended even to the Last Dollar and the Elkton mines. But the foregoing statement in relation to draining the district must be so modified as to exclude a certain part on the eastern side, comprising the mines about Independence on the east side of Bull hill and those on Battle mountain and in the town of Victor, in which the effect of the El Paso tunnel is slight. The Findley, Hull City, Vindicator and Golden Cycle mines about the town of Independence seem to occupy a separate drainage basin, probably divided from the main area by masses of relatively impermeable rock.

The Portland, Stratton's Independence and the other mines near Victor occupy another drainage basin. Of these the Gold Coin and Stratton's Independence have shafts below the level of the El Paso tunnel, and their pumps have probably drained the surrounding territory to a considerable extent. The influence of the drainage tunnel on the Portland mine is a question upon which opinions differ.

The subject of the drainage of the Cripple Creek mines has been actively studied in late years, and valuable contributions to the subject have been made by V. G. Hills and others, who have shown that the water can be tapped, without prohibitive expense, down to an elevation of 7500 feet, or 1300 feet below the El Paso tunnel. For this depth a tunnel  $3\frac{1}{2}$  miles long would be needed. On account of the great porosity of the rocks it is not probable that the next 1000 feet below the El Paso tunnel level will show any great diminution in the amount of water stored in the rocks.

**SUBTERRANEAN GASES.**—During the earlier years of Cripple Creek no unusual amount of mine gases was observed, but, as the shafts and workings deepened, several properties began to experience much annoyance and even serious interference with work, often in spite of vigorous measures for ventilation. These gases appear to issue chiefly from the breccia, especially where it is of porous and loose texture, but they sometimes flow from partly open vein fissures in such quantity that a light held up to the fissures is immediately extinguished. Thus far the mines on Battle mountain and those of the Golden Cycle, Vindicator and Isabella groups have suffered no inconvenience, but most of the mines west of this line have had more or less trouble with this subtle and insidious enemy. At least one mine has been forced to close down entirely, and several others are often obliged to abandon work for days. Sometimes the amount of gas issuing is small, and ordinary ventilation will carry it away. Again it may issue in large volumes and practically fill the mine for some time. In other mines the gas persistently hangs at certain places, forming barriers which can be passed only with difficulty. The outflow of gas is unquestionably related to barometric fluctuations, though it is usually locally reported to be influenced by the direction of the wind. The

distress, and several fatal accidents have been caused by men entering drifts and winzes filled with it.

The characteristics of the gas seemed to point to carbon dioxide, and it is generally so termed. Preliminary determinations of carbon dioxide by a portable apparatus yielded percentages which seemed far too small in comparison with the effects of the gas examined and led to the belief that some other substance was present. Samples were then collected and analyzed. The analyses showed the gas to be a mixture of nitrogen with about 20% carbon dioxide and a small amount of oxygen.

The occurrence of these exhalations over a large part of the ore-bearing area is of much interest. They certainly increase in quantity with depth and it is to be feared that in some cases they may seriously affect mining operations. The evil has proved very difficult to cope with. Ventilation alone has rarely proved efficient and the only practical remedial measures appear to be cementation of drifts at particularly bad places and working the mine under air lock at a pressure slightly exceeding the normal.

The origin of these gases cannot reasonably be sought in any such explanation as the oxidizing of sulphides and accompanying absorption of oxygen. We believe that they represent the last exhalations from the throat of the extinct Cripple Creek volcano.

**FUTURE OF THE DISTRICT.**—To predict the future yield of any mining district is no easy task; the conditions under which most ores are deposited are as yet too imperfectly understood, and the deposits themselves are usually too erratic in form and distribution to give certitude to such predictions, even when these are based upon a careful study of the history and present condition of a district. Nevertheless, it is part of the duty of the geologists who have officially investigated the Cripple Creek district to interpret to the best of their ability the bearing of ascertained facts upon future development. For such a forecast of the future moderate probability is all that can be claimed.

The largest known ore bodies of the district are apparently confined within a zone which extends from the surface to a depth of 1000 feet. In general, explorations below that depth have been much less satisfactory, as regards quantity of ore, than explorations above. It is certainly true that some large ore bodies as yet show no sign of depletion in depth, and that some good pay shoots have been found at a depth of 1400 to 1500 feet. On the other hand, the number of ore shoots that have been exhausted with increase in depth is considerable.

It is probable that the ore bodies, known or unknown, occurring below the 1000-foot zone are neither so large nor so abundant as those nearer the surface. The discovery and exploitation of these deeper ore bodies is, moreover, beset with increasing difficulties, chief among which is the problem of dealing with the underground water. For these reasons it is unlikely that the zone between the 1000-foot and 2000-foot levels will yield as much as the zone between the surface and the 1000-foot level, but the possibility is not denied that some strong fissures may carry payable ore to far greater depths than those yet attained.

As regards the zone above the 1000-foot or 1500-

\* Abstract Bull. 254. U. S. G. S.



foot level, it is well to bear in mind that it still contains much ore, both as parts of known ore shoots and as yet undiscovered ore bodies. It is certain many of these undeveloped ore bodies will be mined in the near future and that this zone will contribute the most important part of the production.

### Gases in Mines.

Written by W. POOLE, Director Charters Towers, Australia.  
School of Mines.

This subject is a very important and interesting one to all miners and mining communities. There is a large number of gases met with in mines in appreciable quantities, from which the air of the atmosphere is free, or almost so. Almost without exception these gases, whether naturally or artificially produced, pollute or poison the air for breathing purposes. Thus it may be easily seen how necessary it is for those engaged in mining operations to be acquainted with the nature of these gases and the methods by which they may be readily detected, especially those gases which may be given off or formed under ordinary working conditions of the mine.

Air consists principally of a mixture of the elementary gases nitrogen and oxygen, but it always contains in addition some carbonic acid gas, water vapor and a trace of ammonia. The amount of water vapor varies considerably in the air, but, taking a rough average, the percentage composition by measure will stand thus:

Nitrogen .....	77.95
Oxygen .....	20.61
Moisture .....	1.40
Carbonic acid .....	0.04

The atmosphere of mines is subject to various influences which are constantly rendering it less fit for supporting life; not only do noxious gases escape from the rocks of the underground excavations, but the very agents themselves employed in the excavation of the work pollute the air considerably.

Gases sometimes given off in mines are: Carbon monoxide, carbonic acid gas, marsh gas, nitrogen, sulphuretted hydrogen, the vapor of mercury and volatile hydrocarbons.

As before stated, the air of the atmosphere consists principally of nitrogen and oxygen, together with varying small percentages of water vapor and still less of carbonic acid gas.

Oxygen has a density compared to air of 1.1. It is colorless, odorless, tasteless, non-poisonous gas. This elementary gas is the important constituent of air which maintains all ordinary processes of combustion and which maintains life when the air is breathed. Accordingly, processes of combustion become more rapid and vigorous when oxygen is supplied more rapidly or in larger proportion, and respiration becomes insufficient to support life vigorously, or even to maintain it at all, when air is deprived of its oxygen until only 10% of that gas is present.

Nitrogen has a density compared to air of .965.

This gas is the major constituent of air, which it nearly approaches in density. It is colorless, odorless and tasteless gas; it is neither combustible nor does it support combustion, nor is it poisonous. Its province is to dilute the oxygen of the atmosphere on which life depends. Were it not for this dilution, oxidation would be too rapid, and not so completely under control as it is at present. The effect of nitrogen on human life would be to suffocate it if breathed pure, inasmuch as it would exclude oxygen from the lungs.

Nitrogen itself has no life-giving power. Although nitrogen is a very inert element, nevertheless many of its compounds are noted for their very active properties. Among those noted compounds are: Nitric acid, one of the most powerful acids; ammonia, one of the most pungent odors with which we are acquainted; prussic acid, of which potassium cyanide is a compound, one of the most deadly poisons; nitroglycerine, one of the most violent explosives—in fact, most explosives contain a nitrogen compound.

Marsh gas, often called "carburetted hydrogen" or "methane," is a chemical compound consisting of 4 atoms of hydrogen and 1 of carbon. It is one of the chief gases occluded from coal seams; and these gases may, for experimental purposes, be represented by the ordinary coal gas supplied for illumination.

Pure marsh gas is colorless, odorless and tasteless, and is lighter than air. Its specific gravity compared to air is 0.559. It may therefore be poured upwards into a vessel, and an upward movement given to a balance that was before in equilibrium.

Marsh gas diffuses rapidly in the air, forming the explosive mixture known as firedamp.

Marsh gas burns but does not support combustion, and a lamp placed in it will immediately be extinguished. Mixing it with small proportions of air only tends to hasten the burning of the gas. When the mixture is diluted until only 16% of marsh gas is present, it begins to be explosive, but as the proportion of marsh gas in the air approaches 10% the mixture burns with great rapidity—so much so that it is said to be highly explosive. When the proportion reaches 10% the explosion is the most violent possible. If the air increases gradually above this proportion, the mixture becomes less and less vio-

lently explosive, and at last ceases to kindle at all in contact with flame. When the proportion of marsh gas in the air falls below 6%, the gas cannot be fired, but it still shows its presence by burning a pale-blue halo or cap above a flame. Special lamps have been invented for use in coal mines, both for general use and to detect and measure the quantity of this dangerous gas.

Firedamp has been encountered in the old workings of alluvial mines in Victoria. In some instances it is undoubtedly due to the decomposition of mine timbers, and in others to the gradual alteration of driftwood in the alluvial beds. Quite recently an explosion took place in a metal mine in New South Wales, presumably from the same cause.

Afterdamp is the name given to the mixture of gases resulting from an explosion of firedamp. It varies in composition. It usually consists of free nitrogen, steam, carbonic acid, carbon monoxide, and with little or no oxygen. If there is much fine coal dust in the mine, it greatly increases the proportion of the deadly carbon monoxide. The steam that is formed soon condenses.

**CARBONIC ACID OR CARBON DIOXIDE.**—This is often called "blackdamp" or "chokedamp." It consists of 1 atom of carbon and 2 of oxygen. It is 1.5 time heavier than air; may be poured downwards and made to depress one side of a balance that was in equilibrium. It, therefore, tends to accumulate near the floor and in the low places of mine workings. It is the product of complete combustion of carbonaceous material in a full supply of air. It is also the product of the breathing of men and animals and the burning of lamps. It is also exuded from the workings of many mines, both coal and metalliferous. Carbonic acid is colorless, odorless, but possesses a peculiarly sweet taste, which may be detected in the mouth when it is inhaled in large quantities. It is not combustible, nor does it support combustion. Lamps are at once extinguished by it. It diffuses slowly and is a difficult gas to remove in ventilating.

Atmospheric air, as already stated, contains usually about 0.04% of carbonic acid. This proportion has no effect upon the respirability of the air, but if the proportion of the gas increases it will at least reach an amount which renders the air unfit to support life. The extreme limit has been stated to be about 15%, but even less proportions than this in the air cause drowsiness when the air is breathed, and should not be inhaled for any length of time.

Fifteen per cent of carbonic acid in the air will at once extinguish the flame of a candle. If, therefore, in going into a pit or mine workings the candles are extinguished or commence to die out, it is an imperative warning that it is unsafe for men to remain there. It is very fortunate that the amount of carbonic acid which just extinguishes a candle is not immediately disastrous to human life; a narrow margin of safety is thus allowed, giving men due warning to immediately retreat, and it is only courting a fatal result not to obey at once.

Carbon monoxide (often called "whitedamp") is a chemical compound of 1 atom of carbon united to 1 atom of oxygen. It is formed by the incomplete combustion of carbonaceous material with a limited supply of air. It is largely produced in a smothered mine fire; it is also one of the products of blasting. It is also produced when steam is passed through or over glowing embers, hydrogen being at the same time produced. It is in this manner that water gas—a gaseous fuel, composed of hydrogen and carbon monoxide—is produced commercially.

Carbon monoxide is colorless, and has a faint, sickly smell. It is combustible, burning with a light-blue flame. This is the flame often seen over a coal fire. It also forms a faint bluish mantle round a candle flame when the latter is burnt in air containing this gas, but as such a small proportion of carbon monoxide is fatal to life, it cannot be used as a reliable indication of danger.

Carbon monoxide is also a supporter of combustion, being the only mine gas that burns and also supports combustion. This gas has the widest explosive range known to mining except hydrogen. The chief danger arises from its powerful poisonous action, when it is inhaled even in small proportions, probably less than 1%. It is rapidly fatal when breathed. Those who have been poisoned by this gas retain much the appearance of life, the color of the skin being only slightly changed.

This gas is the one to be most dreaded in mine workings, as it gives no warning of its presence, and such a small proportion is fatal. It acts on the human system as a narcotic; in small proportions it produces drowsiness or stupor, followed by acute pains in the head, back and limbs, and afterwards by delirium. In large quantities it is quickly fatal.

**SULPHURETTED HYDROGEN.**—The highly poisonous sulphuretted hydrogen is found in sulphur and occasionally in some metal mines. It is also produced in small quantity in the firing of blasting powder. Its strong and highly offensive smell renders its presence easily detectable. It is thought to be sometimes generated in old mine workings, and is supposed to have been the cause of a death at a mine on the Gympie goldfield about fifteen or sixteen years ago.

**ARTIFICIAL POLLUTION OF THE AIR IN A MINE.**—The pollution of air in a mine is not due solely to

gases introduced naturally from the surrounding rocks, an explosion or gobfire in a coal mine, or fire among the timbering of a metal mine. (In a coal mine the worked out portions are called gobbs; coal dust and slack are often thrown back into the gob. Fires from spontaneous combustion sometimes take place among these gob heaps.)

Various other causes combine to render the atmosphere of the mine unfit for life; among them may be mentioned the following:

(1) Respiration of men and animals in the mines.  
(2) Combustion of the lamps and candles used for lighting the workings.

(3) Absorption of oxygen by pyrites and other minerals.

(4) Putrefaction of timber.  
(5) Explosion of gunpowder, dynamite, etc.  
(6) Stone dust from boring.

(1 and 2) The pollution of the air by respiration and the burning of candles, etc. These sources are self-evident and need no further comment.

(3) Where the ventilation is sluggish the absorption of oxygen by pyrites and other sulphides, or by ferruginous minerals passing to a higher state of oxidation, is sometimes very marked. Not only is oxygen absorbed from the air, making it less fitted for breathing, but the temperature of the workings may also be greatly increased, and thus for two reasons rendering a strong current of pure air necessary for those working there. At Broken Hill the very high temperature in the friable, soft, decomposing sulphides is very marked, and it is very much hotter than in the solid undecomposing sulphides at a lower level.

(4) More important is the foulness of the underground atmosphere produced by the decay of the timber supports. The rapidity with which timber rots underground varies considerably, being very rapid where the conditions are moist and hot, and may be slow where totally submerged under water. The practice of leaving the useless decaying timber to infect the new pieces that are put in turns a level, in some instances, into a hotbed of putrescent matter, offensive to the smell and injurious to the health of the men.

One of the recommendations of the ventilation board in Victoria was that all bark should be removed from the timber before it is sent underground.

(5) It is well known both to miners and chemists that explosives produce noxious gas, despite what makers say to the contrary.

Nitro cotton, or guncotton, should produce by its explosion both carbonic acid, carbon monoxide, hydrogen, and nitrogen; while nitroglycerine produces only carbonic acid, nitrogen, and oxygen. But when imperfectly detonated the resultant gases are more numerous; both explosives will then generate a large proportion of nitric oxide and carbonic oxide, and both poisonous gases are liberated in considerable quantities.

(6) Lastly, we come to stone dust, which is certainly not the least noxious of the impurities of the atmosphere breathed by the miner. It is formed in boring holes for blasting, by the shots themselves, and by the attrition of pieces of rock tumbling about during the ordinary processes of mining. However, the first cause—i. e., in boring—is the one from which the miner is most likely to suffer injury. When he is boring a hole downwards he puts in water, which serves the double purpose of facilitating his work and of preventing any dust from being formed. But when he bores an "upper" by hand, water is not used, and even where machine drills are employed, it is not always that one sees a jet of water under pressure applied to the borehole. The result is that the atmosphere of an end or stope may contain a quantity of fine particles of stone dust in suspension, which are inhaled into the lungs and irritate the air passages. Very probably they are the principal cause of the complaint known as "miners' consumption" or miners' phthisis. This complaint, which is so prevalent among machine drill men, is receiving great consideration on the Rand, in America, and some parts of Australia. The consensus of opinion is in favor of compelling mining companies to provide a water jet for each machine, and also to compel the miners to use it when provided.

From the nature of these before-mentioned gases it will at once be evident how necessary it is to provide efficient ventilation through the working places of mines. As the workings of a coal mine are usually only in one plane, and that but little inclined from the horizontal, it has been found necessary to always provide mechanical means for producing the ventilating currents, which may have to be led 2 or 3 miles from the shaft. In metal mines, on the other hand, there are usually several working places at different levels. The increasing temperatures met with at each lower level will cause an underground circulation of air between the levels if they are connected by passes and winzes. But this alone is not sufficient, as the underground workings must be connected with the surface by two independent airways. This is effected by close-boarding one compartment from the other in a straight shaft, or, preferably, by a second shaft in that or in an adjoining mine to which there are free underground air connections. In a single underlie shaft the downcast follows the floor and the upcast the roof of the shaft. Where



there are both an underlie following the lode and a straight shaft cutting it at depth, the straight shaft will be the downcast and the underlie the upcast.

A fire or an explosion having taken place in a metal or coal mine, it is often necessary for a rescue party to go in to bring out any survivors or the dead bodies of any victims of such a catastrophe.

In a coal mine there are always two main airways, one taking fresh air from the downcast shaft to the furthest workings, and the other, or return airway, conveying polluted air and noxious gases to the upcast shaft. An explosion usually seriously deranges the system of ventilation, the brattices, doors, etc., having been destroyed and allowing the airways to be short circuited. In order to restore the circulation, the fresh-air currents are followed along and the doors and brattices erected or arranged to lead the air to that portion of the mine from which the foul gases are first required to be removed. In coal mines, as the ventilation is maintained by powerful fans, a strong current of fresh air can, therefore, be led into any part of the workings. The heavy foul gases are not, however, readily removed without considerable trouble from some quarters. It may be necessary to proceed at once into such places in making a general exploration or to remove bodies, and in such cases the men going in must be specially protected from the deadly gases that may be encountered. Special apparatus have been invented for such purposes; they are also used in going into dangerous quarters in a metal mine during or after a fire. The ventilation in a metal mine is not so readily restored as in a coal mine, the ventilation usually depending upon natural and not artificial means. The heated poisonous gases may cause a reversal or dislocation of the ordinary ventilation currents. The carbonic acid given off from a fire in a metal mine at first tends to rise, owing to it being greatly heated, but as soon as it cools it tends to settle down into the lower levels, and thus the whole of the workings in a mine or collection of mines may become polluted and dangerous to enter. Even after entering with the downcast fresh air, there is thus danger in meeting foul air, when the main current of fresh air is left to explore some part of the workings where the air current is sluggish.

Several apparatus have been invented to enable men to safely go into foul gases. The apparatus consists of some kind of a helmet or head covering in which the lower part is buttoned down close to the shoulders. The air is supplied from an air pump by means of a flexible pipe, or from a portable reservoir in which it is carried under considerable pressure. The flexible tube is only suitable for short distances.

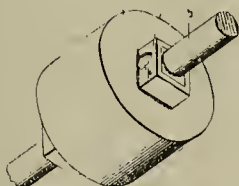
As a candle will seldom burn where it is necessary to wear a helmet, the wearer should be provided with a portable electric light.

## Mining and Metallurgical Patents.

PATENTS ISSUED JANUARY 31, 1905.

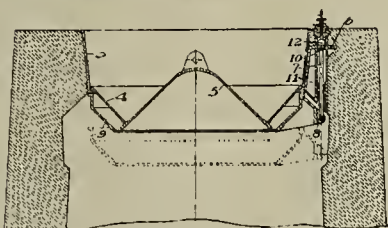
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

GRINDING ROLL.—No. 781,043; T. Woodrum, Webb City, Mo.



Crushing roll comprising solid cylindrical body portion having integral terminal hubs, hubs and body portion being pierced by polygonal channel, shaft having polygonal portion to engage channel, polygonal portion terminating with outer faces of hubs, and bolts passing through hubs and shaft.

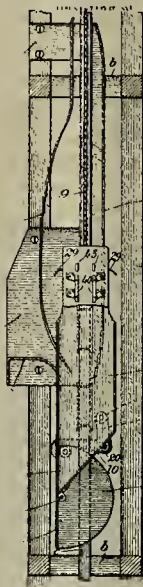
BLAST FURNACE CHARGING APPARATUS.—No. 781,615; T. McDonald, Youngstown, Ohio.



In blast furnace charging apparatus, hopper, bell arranged to close same, deflector ring outside of bell and independent of movements, and means for vertically adjusting ring independently of bell; and arranged around lower portion of hopper when in in-

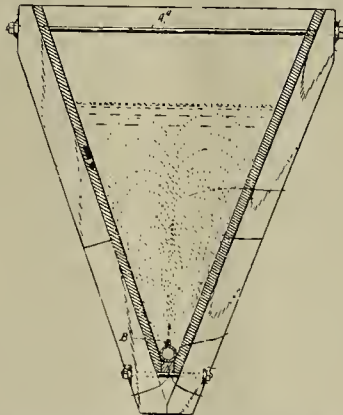
operative position, and means for raising and lowering ring.

AUTOMATIC DUMPING ORE ELEVATOR.—No. 781,450; D. B. McTaggart, Butte, Mont.



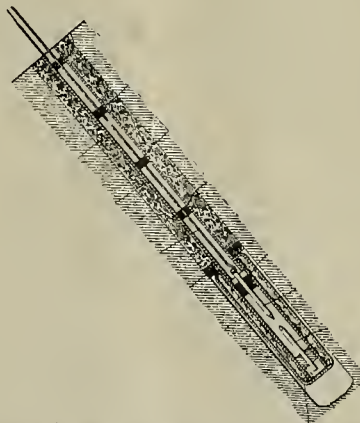
Combination of frame, car movable therein, car having opening near bottom portion thereof, apron pivoted to car and adapted to close opening when car is loaded, apron acting as discharge chute for material passing from car, when apron is moved upon pivot to permit such discharge, elbow lever pivoted to car and designed to engage with projection formed on apron for locking latter, and relatively long bearing strip for automatically tripping locking lever to its disengagement from projection.

PROCESS OF TREATING ZINC SULPHIDE ORES CONTAINING IRON.—No. 781,133; C. E. Dewey, Denver, Colo.



Process for treatment of zinc sulphide ores containing iron, consisting first in roasting ore, whereby zinc is converted into zinc sulphate and zinc oxide, and iron present, into ferric oxide as far as practicable; second, placing ore thus prepared in water; and third, maintaining ore in suspension in solution by introduction of sulphurous gas whereby zinc oxide present is formed into zinc sulphite, and latter into zinc sulphate by reaction with ferric oxide.

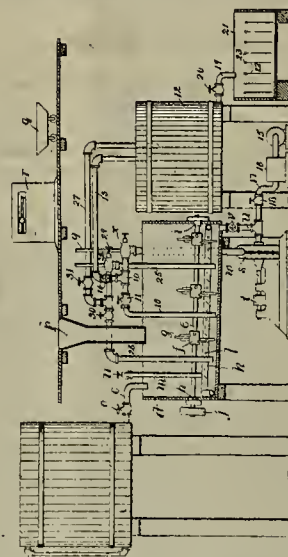
BLASTING APPARATUS.—No. 781,619; S. Rogers, Anniston, Ala.



In blasting apparatus combination with metal tube provided with electric heating chamber at its inner end, of closed casing surrounding same, composed of fragile material, and adapted to contain liquid which when heated to proper temperature will disrupt

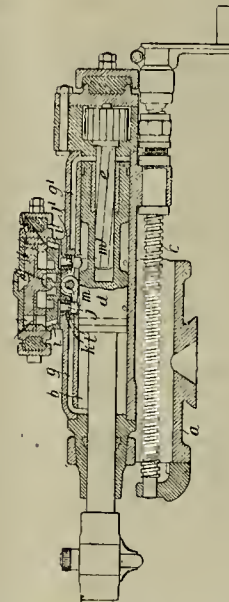
casing, all constructed and arranged to operate as and for purpose set forth.

METHOD OF TREATING ORES.—No. 781,520; H. A. Hogel and H. A. Hogel, New York, N. Y.



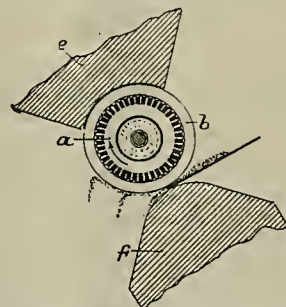
Method of treating ore to bring metallic particles thereof into solution quickly, which consists in pulverizing ore, then subjecting it to action of solution containing suitable chemicals and intensifying and quickening solvent action of solution upon ore by atomizing mixed mass under influence of heat, and agitating mass by means of currents of air or steam.

ROCK DRILL.—No. 781,241; W. C. Stephens, Cambridge, England.



In rock drill, combination with working cylinder and reciprocating piston therein, of distributing valve casing for cylinder provided with air locks, and distributing valve in casing, ports in cylinder connected with passages extending to air locks, adjustable bushings in ports and movable valves having portions for directly engaging bushings and wearing portions projecting into cylinder in path of piston, whereby wear on valves and piston may be compensated by adjustment of bushing.

ELECTROMAGNETIC ORE SEPARATOR.—No. 781,077; E. Langguth, Euskirchen, Germany.



In magnetic separator, combination with pole pieces, of armature rotating between pole pieces and having windings, shield of magnetic material mounted directly on armature and rotating therewith, means for feeding material to be separated to armature, and means for collecting separated material.



## Gold Mining in Rhodesia.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS by F. C. ROBERTS.

**FINANCIAL CONSIDERATIONS.**—The British South Africa Co. formerly had the right to demand up to 50% of the vendor's interests in any mining flotation, but the right was seldom exercised up to its fullest extent; this has now been reduced to 30%.

This right is generally satisfied by the transfer of a certain number of shares upon the formation of a company.

The *modus operandi* obtaining in Rhodesia, and adopted by practically every financial house operating here, contains many features which to those unacquainted with the local conditions and market considerations would appear to cast an unnecessary burden upon the gold mining companies in the shape of heavy capitalization.

The capitalization of many of the mining companies which have elected to operate in this country has been the subject of adverse criticism by most visitors here, and no doubt adequate grounds are offered for such criticism; but when all of the circumstances attending the handling of a mining venture in Rhodesia are duly weighed, it would seem to lessen the responsibility of some of the "parent" companies.

A mining claim in Rhodesia embraces an area 150 feet along the strike of the vein or old working by 600 feet, measured 300 feet from a center line through the outcrop or old working, hence ten claims constitute a block or location, 1500 feet by 600 feet, as defined by the United States mining code. The mineral ordinance of Rhodesia is really only a modification of the United States law.

What is termed the "parent" company in Rhodesia is a limited liability company, with a capital of from \$150,000 in small concerns to \$4,850,000 in the larger houses, formed for the purpose of acquiring mines, lands, farms, etc., the latter being largely dealt in in order to secure the timber in close proximity to the mining interests, which, up to the present, constitutes the only fuel in the country. The company pays a royalty of \$1.20 per cord to the farm owner.

The number of claims controlled by these parent companies varies from 100 in small concerns to 5000 in larger companies.

The object of the parent company is to carry out a system of prospecting and development work upon their more favorable interests, with a view (where the conditions warrant) to placing independent properties upon the market for flotation into "gold mining companies." It is obvious that in a country where development expenses are very high there must be a limit to the extent to which this work can be extended, if more than one property is to be dealt with, for if an attempt were to be made by the parent company to develop from eighteen months to two years' ore over a reasonable width upon a number of interests at the same time, it would be impossible to finance the work; hence it is clear that the gold mining company faces very grave responsibilities, and therein lies the key to many early liquidations. The problems with which the parent company is faced are as follows:

A—Capital and shares involved in purchase of property.

B—Capital involved in prospecting and development work.

C—Capital involved in installation of temporary surface equipment.

D—Interest accumulating upon capital invested.

The chief considerations of the gold mining company are as follows:

1—Capital involved in purchase of property from parent company.

2—Capital involved in development work.

3—Capital or shares involved in commutation of British South Africa Company's rights.

4—Capital involved in purchase and erection of plant.

5—Capital or shares involved in making provision for possible extension of plant.

Assuming a width of vein of 30 inches and the ore bodies not too scattered, it would be necessary to make provision for an expenditure of no less than \$363,750 in order to bring a property to the milling stage, and equip it with a 20-stamp mill with cyanide annex, etc. This expenditure should, under ordinary circumstances, enable one to develop from eighteen months to two years' pay ore.

As a matter of fact, no mine in this country should begin the reduction of ore with less than three years' ore in such a state of exposure as to be reasonably counted upon to return a margin over and above the estimated operating expenses, as it is next to impossible to keep the development work as far ahead of the reduction plant as the constantly fluctuating and inefficient labor supply demands.

The money required for the equipment of a mine with a modern reduction plant is as important a financial consideration as the provisions necessary for extending the development work.

(TO BE CONTINUED.)

## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

## ALASKA.

At Silver Bay, on Baronof island, the Chicago-Sitka G. M. Co. has struck a 22-foot vein of free milling ore, after driving 2200 feet of tunnels and drifts. H. A. Bowers, the president of the company, has left Alaska to confer with Chicago stockholders as to equipping the property with a mill. The Escot mine, near Wrangell, has been bonded to H. H. Hunter of Juneau, who has men at work at the mine.

The Triple M. & Ditch Co. of Seattle, Wash., has been formed to build irrigating ditches and develop mining properties in the Kiguarok district. F. W. White is president, C. E. Keen vice-president and general manager, E. E. Gledhill secretary and treasurer, with headquarters at the Oriental Block, Seattle, Wash.

Hills & Reck are opening a mine in the town of Juneau, where they are developing a lode on the mountain side and have crosscut 42 feet of fine looking ore. They intend to continue the work and will have a mill test made.

A new quartz discovery is reported by J. T. Martin and others, 25 miles southeast of Windham on the mainland, says the Juneau Dispatch. This is thought to be an extension of the main zone. If so, it will add 30 miles of unexplored territory to the already proven territory, making 170 miles of a mineralized belt.

## ARIZONA.

## Pima County.

In the Empire Gulch, on the north side of the Santa Rita mountains, near Patagonia, M. Ensenburg is putting in a plant to work placer ground at the forks of Empire and Chispa gulches. The outfit will consist of a steam shovel and a gold washing machine. G. L. Smith of Cincinnati, O., is superintendent.

## Santa Cruz County.

Regarding the Tyndall district, in the Santa Rita mountains, the Nogales Oasis reports that at the Wandering Jew mine, near Patagonia, M. Lulley and associates are running a tunnel to cut into the ore body at a depth of 100 feet below the bottom of the 100-foot shaft. The tunnel, which will reach the ledge at a distance of 348 feet, is now in 75 feet.—J. Peterson and G. Clark are working the Viceroy mine, in Squaw gulch, having run a tunnel 400 feet on the ledge.—In the properties of the Happy Jack M. Co., W. H. Barnett manager, the main tunnel is in 735 feet and crosscutting is being done.

At the head of Josephine canyon J. Kane is working the Santa Cruz and Tia Juana mines, in which there is a 20-foot ledge, with a 3-foot paystreak of molybdenite.—The Eureka mine of the Salero Mines Co., W. E. Balcom superintendent, has a tunnel 500 feet long and is steadily shipping ore.—The litigation over the Bland group of mines has been settled and they will be developed by W. P. Savage of Patagonia.—F. C. Lincoln, formerly instructor in the New Mexico School of Mines, has leased the properties and concentrating mill of the Arizona G. & C. Co. at Patagonia, and has resumed operations. At the Trenton mine the water has been pumped out of the 150-foot shaft to clear the 110-foot level, and the level has been extended, cutting into a shoot of good ore showing galena, gray copper, etc. The concentrator will be overhauled and set to work.—Superintendent Reed of the El Plomo is running a 2100-foot tunnel and will sink a 700-foot shaft from the top of the ridge. He will put in an air compressor, dynamo, hoiler, engine and machine drills. J. N. Curtis is general manager. A road is being built to connect the mine with Patagonia.

## Yavapai County.

In the Prescott Courier, J. J. Sanders reports that the mineral production of Yavapai county for 1904 amounted to \$5,939,859.79, as follows: Gold, \$1,428,233.63; silver, 325,619 ounces; lead, 356,619 pounds; copper, 30,920,119 pounds.

The Bradshaw Mountain Copper M. & S. Co. completed a tunnel 2200 feet in length into their mines at Middleton, cutting five veins averaging from 16 to 85 feet in width and carrying good values in copper, gold and silver. A short time after this company acquired the Val Verde smelter, a fire destroyed the plant. They have since raised \$500,000 for a new plant.—The Poland tunnel, over 8000 feet in length, was completed early in the year.—Sixteen miles of railroad were built in the completion of the Bradshaw Mountain road to Crown King. The completion of this railroad has greatly stimulated the production and development of the mines in that section of the county.—The United Verde Co. operated its mines and smelters at Jerome steadily during the year, and erected a 250-ton smelter on the Equator mine, 8 miles from Jerome.—The Treadwell M. Co. erected a 250-ton smelter.—The Congress Gold Co. confined the greater part of their work for the year in doing development work.—The Octave mine at Octave is being worked through two shafts, one 1850 feet and the other 1750 feet deep.—The Yeager Canyon Co. erected a 60-ton concentrating plant.—The Model M. Co. put a 50-ton mill with Wilfley concentrators on the McCabe mine, east of Prescott.—The Gladstone mine, near the McCabe, has been worked during the year under a lease and has been producing steadily.—The Little Jessie, near Mayer, has been repaired in mine and mill.—The Stark G. M. Co. completed a 10-stamp mill and 30-ton cyanide plant on the Hidden Treasure mine.—The White G. M. Co. put up a 20-stamp mill and a cyanide plant for the treatment of their ores.—The Monica mine at Kirkland erected a 10-stamp mill with a 30-ton cyanide plant.

The mines of Yavapai county are equipped with milling and smelting machinery capable of treating 5070 tons of ore daily. The smelting capacity is 2750 tons and the milling capacity is 2320 tons.

## Yuma County.

The White Eagle M. Co., working gold and copper claims at Empiro Flat, intend to build a smelter at the mine when the branch of the Santa Fe, being constructed from Congress Junction to the Colorado river, is finished, probably about the first of May. J. H. Watson is superintendent.

## CALIFORNIA.

The following table shows the yield and value of mineral substances of California for 1903, as per returns received at the State Mining Bureau, San Francisco, in answer to inquiries sent to producers:

Mineral.	Quantity.	Value.
Asphalt, tons.....	41,670	\$503,050
Bituminous rock, tons.....	31,914	53,100
Borax (crude), tons.....	34,430	691,400
Cement, barrels.....	640,888	968,727
Chrome, tons.....	150	2,250
Chrysoprase.....		500
Clays—for pottery, tons.....	60,972	49,097
Clays—for brick, M.....	214,403	1,060,546
Coal, tons.....	93,025	265,383
Copper, pounds.....	10,113,861	2,520,997
Fuller's earth, tons.....	250	4,750
Glass sand, tons.....	7,725	7,825
Gold.....		16,471,264
Granite, cubic feet.....	408,625	678,670
Gypsum, tons.....	9,014	40,441
Infusorial earth, tons.....	2,703	16,015
Lead, pounds.....	110,000	3,960
Lime, barrels.....	460,587	418,600
Limestone, tons.....	125,919	163,888
Lithia mica, tons.....	700	27,300
Macadam, tons.....	605,185	436,172
Manganese, tons.....	1	25
Magnetite, tons.....	1,361	20,515
Marble, cubic feet.....	81,024	97,354
Mica, tons.....	50	3,600
Mineral paint, tons.....	2,370	3,720
Mineral water, gallons.....	1,978,340	558,201
Natural gas, M cubic feet.....	120,134	75,237
Paving blocks, M.....	4,854	134,642
Petroleum, barrels.....	24,340,839	7,313,271
Platinum.....		1,052
Pyrites, tons.....	24,311	94,000
Quartz crystal.....		1,908
Quicksilver, flasks.....	32,094	1,335,654
Rubbe, tons.....	1,610,440	1,237,419
Salt, tons.....	102,895	211,365
Sandstone, cubic feet.....	353,602	585,306
Serpentine, cubic feet.....	99	800
Silver.....		517,444
Slate, squares.....	10,000	70,000
Soapstone, tons.....	219	10,124
Soda, tons.....	18,000	27,000
Tourmaline.....		100,000
Turquoise.....		10,000
Total value.....		\$37,750,040

## Amador County.

The State Supreme Court has affirmed the lower court's decision in a suit entitled Central Eureka M. Co. v. the East Central Eureka M. Co. A man named Toman is a joint defendant. The Central M. Co. gave Toman a deed to the agricultural rights on the land, lying to the eastward of the lode and beneath which the lode dips. Toman sold his right to the East Central M. Co., which also claimed the right to the minerals. The lower court held that the Central company had not disposed of the mineral right, and the Supreme Court has affirmed the ruling.

## Calaveras County.

D. P. Gray is ground sluicing on the Hagerman ranch, near San Andreas, on the Calaveras river. There are thirty acres of gravel, lying between the river and the adjacent hill side. Much of the high bar gravel of this vicinity has never been systematically prospected, but is known to contain gold.

## El Dorado County.

The Union M. & E. Co. at Georgetown have elected T. A. McCullough president, G. F. Randall vice-president, J. G. Tillar secretary and treasurer and J. M. Isgrig general manager. The mine is at Fort Hill.—M. W. Sargent is preparing to hydraulic on the Mameluke Hill, near Georgetown.

A. P. Grasser has put a hoist and gallows frame on the Zantgraf mine, near Auburn.

## Inyo County.

In the Sherwin district, 20 miles northwest of Bishop, B. E. & J. Sherwin have bonded the Casa Diablo mine to a Chicago, Ill., company, of which the treasurer is W. W. Smith, and the resident manager and superintendent is C. A. Fohrman of Chicago. A 1000-foot tunnel is being driven and arrangements are under consideration for a 30-stamp mill and cyanide plant.—A. E. Vandercook, manager of the Southern Belle M. Co. near Owensville, is adding five stamps to the mill and will put in a dynamo to furnish power for lights and for two electric hoists at inclines below the tunnel level.

## Kern County.

Work has been started on the Bully Boy mine, near Randshurg, by T. W. Atkinson. There is a shaft down 98 feet. A new shaft is being sunk.

## Nevada County.

The Polar Star mine, at Grass Valley, will probably be reopened by W. W. Byrnes. It is intended to replace the present wood-burning system with oil burners. T. Warden has been appointed superintendent.

## Placer County.

The Paragon mine at Bath is working a number of men and gold is being taken out. Men are at work at Eagle Bar and also at the Buckeye. The Baltimore is working twelve men.

## San Bernardino County.

(Special Correspondence).—A. H. Cohn, representing J. R. De Lamar, has bought the newly discovered group of mines 25 miles north of Furnace on west side of Grapevine range, at the north end of Death valley, paying \$25,000 on a \$150,000 contract. It is stated that the vein can be traced through four locations and is 25 feet wide. Ballarat, Feb. 5.

## Shasta County.

O. B. Perry, head of the Indiana Dredging Co. operating at Oroville, Butte county, has acquired a half interest in the Detroit & California G. M. Co., dredging at Horse-town. The company intends building another dredger right away.

## Sierra County.

W. O. Frost found a nugget of gold last week at his



mine in Hungry Mouth ravine, weighing 4 ounces. A short time since he found one weighing 12 ounces near the same place.

#### Siskiyou County.

The Morrison & Carlock mine, at Quartz Valley, is working forty-five men; 600 tons of ore are being crushed each month.—The McKinley quartz mine, at Humburg, is being worked with twelve men.

The gravel mines about Oro Fino are preparing to begin the season's hydraulic mining. There is enough water now for most of these mines. Placer ground is being tested by means of a well-boring outfit.

#### Tuolumne County.

(Special Correspondence).—The Clío mine, near Jacksonville, has resumed operations. The mine is equipped with a mill and other necessary machinery. E. Parr is foreman.

At the Soulshy mine, at Soulshyville, sinking has been resumed in the Pennsylvania shaft, and until the 500 level is opened the mill will be idle. The Pennsylvania shaft is sunk on the east branch of the vein. The old workings are 800 feet deep and are flooded. There has been some talk of unwatering the workings which have been abandoned for years. There is said to be good ore left in the old workings, and indications are that the ore shoots continue to the northward beyond the limits of these workings.—The Gross mill at Tuttletown is crushing ore from that mine.

Sonora, Feb. 6.

Rich rock from above the 400-foot level is being run through the mill at the Mohican mine, near Groveland.

The Minnehaha mine, on the Tuolumne river, a few miles from Groveland, has been sold by W. Vincent to T. J. Crowley.

E. L. Flower and I. B. Watson have inspected the McPherson mine, near Jacksonville, with a view to purchase.

At a recent meeting of the stockholders of Densmore M. Co. the following were elected officers and directors: F. W. Street, president; J. B. Pownall, vice-president; C. Hampton, secretary; J. A. West, treasurer; W. D. Bannister, A. J. Crowell. The mine is 2 miles north-west of Columbia. A. Crowell is superintendent.

F. D. Nicol has sold to H. Shaw a one-half interest in his quartz mine situated at Saw Mill Flat.

A company of San Francisco men are operating the Nigger Hill mine, on the J. Moore ranch, near Columbia. F. Stephenson is in charge of the work and says prospects are good.

E. M. McCutchen and D. M. Garner of Groveland recently bought the Eagle Bluff mine, on the Tuolumne river. Work will be commenced on this mine immediately.

Ore is being stoped from the 300 and 400-foot levels of the Soulshy mine, near Soulsbyville. —The Fair Oaks mine on Provost mountain, 3 miles east of Carters, shows a free-milling vein of ore. The tunnel has been driven 100 feet. The mine will be equipped with facilities for sinking and treating the ore. —At the Draper mine and mill, near Carters, Superintendent Herthel is blocking out the ore bodies. The ore sent to the mill is taken out in sinking and running the various drifts. Additional surface facilities are needed to carry on development work to a greater depth, and the installation of a new and larger hoisting plant has been decided upon. The mill capacity will be increased by five stamps.

#### Yuba County.

At Rackerby, J. E. Spencer is sinking a shaft and putting new machinery on the Abbott mine.

### COLORADO.

(Special Correspondence).—Placer mining is on the increase in different sections of the State, and each year sees important changes in the development of placer ground. The placers near Alma and Fairplay, in Park county, have been consolidated and many improvements are contemplated during the coming summer. The water supply is the vital question to placer mining and unless some scheme is devised to retain the surplus water towards the end of the season the supply is usually cut short. The Snow Storm Co. is making preparations to increase their water supply by a series of reservoirs or other means to hold the water back. It is thought that some of the small lakes near the source of the water supply will be tapped and so arranged that water can be taken from the lakes as needed later in the season. From reports received the snow fall has been quite heavy so far this winter, which means much to the placer companies.

Some good sales of mining property have been reported recently. The latest of importance comes from Leadville, which will have a good effect on that district. The property reported sold to Eastern capitalists is located on Rock hill, near the Reindeer, one of the Rock hill producers.

Denver, Feb. 6.

In his official report to the directors and stockholders of the Portland mine at Cripple Creek, which was presented at the annual meeting in Council Bluffs, Iowa, on the 6th inst., Mine Manager F. M. Kurie, speaking of the mining methods, made the following statement: For some time past it had been the practice to narrow the stopes down to the richest portions of the veins. This is certainly a good way to make a splendid financial showing, but in the end it is very bad for the mine, for the rich ore is usually but a small part of the veins and its exclusive mining, if continued, would shorten the life of the mine materially. We have widened all the stopes to the extreme limits of the pay ore, everything being taken out that could be made to yield a profit, even if it amounted to but a few cents per ton. This has given rise to some very difficult mining problems. In cutting into the walls of the old stopes, very large blocks sometimes become loosened, and the greatest skill is required to prevent serious caves and accidents. The system used in working the veins in the volcanic area has reached such a state of perfection that we can now work at a profit very low grade ore bodies that were until recently considered worthless. The ore is first broken as coarse as possible by breast stoping, i. e., the holes are drilled horizontally into the rock. The object of the

coarse breaking is to avoid, as far as possible, breaking the barren rock to screenings. The higher grade faces are then cobbled off and the waste rock is left in the stopes. This necessitates rough sorting in the stopes. While the amount of development work done in 1904 was a little less than in 1903, being 3 miles 2704 feet, against 4 miles 2353 feet, a difference of 2811 feet, the results of 1903 are not to be compared in any way with those of 1904. An estimate made by Mr. Williams, our mine engineer, a short time ago, showed that for each ton of ore mined in 1904 more than three tons were added to the reserves. This estimate was based on actual measurements of the length, width and height of the blocks of ore. Where a vein had been opened on a level alone the ore was estimated as extending but 50 feet above and below the level. Where the development work had not gone far enough to show the extreme limits of the ore, it was considered as extending but a few feet beyond the faces. Without a doubt the most important find was the Queen of the Hills vein in the granite area to the southwest of No. 1 shaft. This vein has been developed on the 200, 400 and 500-foot levels of No. 1 shaft and was recently cut on the 600-foot level. It is therefore known from the surface to the 600-foot level. Nineteen hundred and three was a record-breaking year in mine costs up to that time, but 1904 shows these costs to have been lowered about 15%. Close supervision, and that alone, is the secret of low cost. The most salient features of the report of Secretary and Treasurer F. G. Peck are as follows:

#### RECEIPTS.

Ore.....	\$2,598,724 84
Insurance.....	11,401 49
Rent.....	300 00
Transfer fees.....	13 50
Royalties.....	3,531 23
All other sources.....	2,687 80
Total receipts.....	\$2,616,658 86

#### EXPENDITURES.

Sampling.....	\$ 5,137 45
Treatment.....	702,860 36
Railroad.....	128,532 88
Permanent equipment.....	8,190 54
Portland mine account.....	137,877 97
General expense.....	68,782 57
Salaries.....	17,724 99
Legal expense.....	19,015 33
Office expense.....	12,051 24
Fuel.....	41,830 51
Explosives.....	50,818 04
Mine supplies.....	41,592 84
Pay roll.....	567,715 42
All other expenses.....	124 42
Total expenditures.....	\$1,802,247 21
Net profits.....	\$814,411 65
Total.....	\$2,616,658 86

The following is Mr. Hills' report on the labor troubles: "The economic feature of the labor troubles has been a great surprise to me. With any change in the majority of the persons on the payroll or any violent change in the policy of management, it is naturally expected that the costs will suddenly rise, temporarily, whatever may be the final result. The raise in cost of production came in June, as was to be expected. With an enterprise requiring a somewhat complicated system of management and employing more than 500 men, I should have been willing to grant a full year's time to return to normal conditions. Yet your management, paying exactly the same wages as before, succeeded in reducing the costs before October 1 to a point even lower than before the change."

The following are the figures by months:

	Cost Per Ton Crude.	Cost Per Ton Shipped.	Cost Per Ounce Gold.
1904.			
January.....	\$ 2 5003	\$9,3465	\$7,9578
February.....	2 3702	8 4150	6 7204
March.....	2 4832	8 7405	7 5195
April.....	2 4707	8 4725	7 0334
May.....	2 3847	8 4650	7 2604
*June.....	2 8493	9 9140	6 7908
July.....	22 5431	8 7048	6 5307
August.....	2 5941	9 0528	6 7021
September.....	2 6572	9 1265	7 0256
October.....	2 1835	8 1275	5 7320
November.....	2 3338	7 5592	5 7877
December.....	2 1087	7 1841	5 0676

\*Twelve days closed; reopened June 21 with non-union labor.

This, I think, reflects more than ordinary credit on the manager, the superintendent and the corps of assistants. With the possible exception of some small properties which employ say less than fifty men, I doubt whether any mine in the district can show as good a record for the same period.

#### Boulder County.

R. S. Billings, general manager of the Golden smelter, reports having "blown in" another furnace, and that the plant is now smelting 300 tons of ore daily. Ore is now coming from all portions of the State. New shipments are added to the list daily, many of whom were unable to work their properties heretofore. A number of properties have resumed and now find a market for their low-grade mineral which could not be produced heretofore except at a loss.

#### Clear Creek County.

L. W. Vidler, manager of the Vidler tunnel at Georgetown, will build a power house, hoarding house and blacksmith shop and put in machinery and power drills.

#### Fremont County.

The Royal Gorge Coal Co., a few miles south of Canyon City, has let a contract for a 400-foot slope to J. Arthur. When the new slope is down the company will be able to raise 400 tons per day. In about ninety days the railroad branch will be completed to the mine and shipments can then be made more conveniently. The company will also do considerable building. President Bettis will put in an electrical equipment, the power to be furnished by the Canyon Electric Power Co. When these improvements are completed the Royal Gorge will be the leading mine in the county.

#### Garfield County.

The Colorado Power & Irrigation Co.'s plan to supply 40,000 H. P. from the Grand river from the headgate at the upper end of Shoshone falls, 10 miles up the canyon from Glenwood, the water to be conveyed through steel flumes, in connection with tunnels, to the site of

the power plant, which will be conveyed 2.65 miles below the headgate. A concrete wing dam, constructed diagonally across the river at the head, will turn the entire body of the stream into the flume at low water, but at higher stages the surplus will pass over the dam without causing any back water. The flume will have a fall of 4 feet to the mile. At its lower end it will be 225 feet above the site of the plant, and at this point a header is to be constructed, from which the water will have an almost vertical fall to the plant at the river level below. Electricity will be generated and carried by a double system of wires to Leadville and surrounding mines.

#### Gilpin County.

The United M. & E. Co., while sinking the 210-foot shaft on the Modoc in Quartz hill district, near Central City, struck a vein containing ore which assays 8½ ounces of gold to the ton, says the Gilpin Observer. The company operating the mine have had a lease and bond since October, during which time sinking on an extensive scale has been done. This is the first vein that has been struck, all the other strikes being deposits or pockets. The Modoc is near the Roderick Dhu, San Juan and Climax, all of which have good records as big producers. It was idle two years prior to the time the lease and bond was taken by the United Co., but before that had been worked about ten years. The manager will ship several carloads of the high grade ore. C. Soper is superintendent of the Modoc.

C. Houser & Co. have started up the Gardner property on Quartz hill and are working in the 350-foot level and will shortly commence work at the bottom of the shaft which is down 1000 feet. The Gardner is one of the oldest properties in the Quartz Hill district. Houser & Co. will commence shipping next week.

The Russell mine, owned and operated by the Russell Mining Co., in the upper end of Russell gulch, near Central City, has been closed down temporarily. The machinery in this mine being inadequate for the hoisting of the ore, the company has decided to put in a new and larger plant. This does not include the leasers, as they will still continue to work the mine, but development work will cease for a short time. The Russell has been a good producer and in the past couple of weeks a fine body of ore has been uncovered which shows values of \$60 per ton. In shaft No. 1 the ore runs \$25 to the ton. This is also a new body opened up.

The West Pewahic belongs to this group and is reported to have produced \$5000 in the past three months, with about 60 tons of ore to receive returns from, which will bring it up to about \$6000. This mine has been worked with a whim. These mines are managed by Mr. Paxton.

#### Gunnison County.

(Special Correspondence).—E. E. Connery, O. J. Mudd, W. J. Baird and J. Schriener Sr., of St. Louis, who, with D. C. Tohin of Leadville, Colo., who recently bought the Continental gold mine, at Vulcan, Colo., last week visited the properties and report important development under way and an increasing tonnage of gold quartz going to smelter at Pueblo. They will soon install a modern amalgamating and cyanide mill.

Vulcan, Feb. 6.

The Jim lode at Carbonate is under the management of J. Stephenson, who has opened up a strong vein. A tunnel is being driven to cut the vein 300 feet deeper. The old bore is in 175 feet. The new tunnel has recently cut a 4-foot lead of talc and mineralized matter. The Jim is owned by Stephenson, Tarkington and Fry.

The Polaris tunnel in Last Chance gulch, owned and operated by a Pittsburg syndicate, is in over 150 feet and has a promising showing. Dodge and Fry, who have a contract for driving the tunnel 100 feet, have nearly finished their job.

The shaft on the Homestake group is to be sunk deeper. The shaft is now 50 feet on a good vein. All of the ore is of a good grade and it is believed that with depth the property will become a regular shipper. High assays in gold and silver are being obtained from the ore mined. H. G. Leavitt of Omaha, Neb., has an interest in the mine.

Good veins are being cut by the tunnel being driven on the Ninety-Four group in Dutch flats. Little attention is being paid to these veins, however, as the principal object in driving the tunnel is to open up the Raymond vein.

#### Hinsdale County.

Mining is beginning to have a decided upward turn in this part of the San Juan, and although the spring season is still some distance away, preparations are under way for the opening up of some of the old-time producers.

Zacharias & Whinnery have a bond and lease on the St. Jacobs mine, and will put the old workings in condition to prosecute development work on the old shoot. The St. Jacobs is at Carson camp, 16 miles southeast of Lake City. About the years 1887 to 1892 this property, though but a prospect, produced high grade sulphuret ore to the amount of nearly \$150,000, but with the slump in silver the property closed down. Since then practically no work has been done on the St. Jacobs.

E. P. Jordan, cashier of the Miners and Merchants' bank at Lake City, has the Belle of the West mine and the Golden Fleece mill and the combination gives every promise of being a good money maker. The Belle of the West was closed down in 1893. Since then this country has been the scene of many building operations with concentrating plants as the chief industry. The mill is located at the mouth of the Belle of the West workings, and the ore in that vein is a simple one for concentrating.

The Fleece mill will for the present be worked on Belle of the West ore. The newly organized Fleece company is planning work to locate the bonanza shoot. All work during the year will be in that direction.

#### Lake County.

One of the largest zinc buyers in Leadville says that before the current year passes ore carrying as low as 15% zinc will be treated at a profit. There is not a mine in the camp that cannot produce large quantities of 15% zinc ore. Twenty-six per cent zinc ore is now being han-



dled at a good profit and treatment methods are being improved right along.

#### Sammit County.

The vein in which the new tunnel of the Old Union M. & M. Co. is being driven is reported having 2 feet of lead-silver ore that will show a smelting value of \$20, beside the streak of high-grade 17.12 ounces gold ore. The gold ore also carries eleven ounces in silver to the ton and good progress is being made in driving the tunnel, which will be equipped with a double track as soon as it reaches the ore bodies which are opened up by drifts from shaft No. 1. The machinery is going in the company's 100-ton concentration mill.

The Carbonate group on Mount Baldy, above timber line, has out a carload of auriferous carbonate of iron, which also carries good silver and lead values. The mine is operated through the lower tunnel. The ore generally runs from one and one-half to three ounces in gold per ton, with lead and silver values making it worth from \$80 to \$100 per ton.

J. Madron and L. Lipp, who are drifting on a small streak of high-grade smelting ore from a new shaft sunk in the Germania group on top of the "saddle" of Little mountain, are operating under a sublease from Mayor Kaiser of Breckenridge. C. Kaiser and J. B. Conrad are sinking a shaft a short distance east of the place where former Lessees Kilnefetter and West took out about \$50,000 worth of ore at the "grass roots." Their shaft is down 40 feet in quartzite. They are expecting to strike the continuation of the flat vein on the dip. A shipment of a carload of ore made last month from their lease netted Madron and App \$997.

The Mineral Bolt and Lucky mining property, located on Mineral hill, 2½ miles from Breckenridge, on the north side of the French gulch placer, has been sold by S. B. Wright of this city to the Beaver Creek G. M. Co., now operating in Buckskin gulch and on Silverheels in Park county. The Breckenridge property consists of twelve lode claims and two mill sites, and is equipped with a mill of 100 tons capacity. There are more than 3000 feet of tunnels and drifts on the property and nearly 2000 feet in shafts. The longest tunnel is 1700 feet and cuts the four large veins running through the hill. Only one of these veins has been partially explored, which opened up large bodies of ore delivered to the mill through the long tunnel. The Beaver Creek G. M. Co. is composed of capitalists of Chicago, Columbus and Mount Vernon, Ohio, and Pittsburg, Pa. F. A. Yauger is general manager.

#### Teller County.

The production of the Cripple Creek mills and smelters for January, as reported by the News, was:

	Tons.	Value.
United States R. & R. ....	25,000	\$ 250,000
Smelters .....	10,000	650,000
Portland .....	8,500	255,000
Economic .....	2,900	101,500
Doreas .....	3,400	108,800
Wild Horse .....	2,500	15,000
King & Craig .....	500	5,000
Other cyanide mills .....	1,000	6,000
Totals .....	53,800	\$1,891,300

The Cold Coin at Cripple Creek is to be unwatered to the 1200-foot level, the bottom of the shaft, in hopes of finding the high-grade shoot opened on the 1100-foot level.

Four feet of ore has been opened in a body of undetermined length by the J. C. Hamby Leasing Co. in the Castle Garden slope of the Ramona, on the west slope of Bull hill. The discovery was made at a depth of 144 feet, on an extension of the War Eagle vein. The body has been followed for 25 or 30 feet. Two or three carload shipments have been made. Settlements indicate \$60 in gold to the ton.

Operation of the washing plant on the Jo Dandy mine of Raven hill have begun under the direction of Smith & McLeod, lessees. It will handle 100 tons of ore and waste daily. Preparation for the work has been under way for several weeks. An ore house has been built and a washer installed. A tunnel has been run into the dump. As much of the ore of the property had a value of \$55, it is believed that good returns may be obtained from handling the deposit. There is enough rock on hand to maintain the venture for a year or longer.

At Stratton's Independence mine large electric lights have been installed to enable the carpenters to continue their work of building the new ore house to replace the one recently burned. Three shifts of carpenters are employed and it is estimated that this work will take seven weeks to complete. The new ore house will contain ten ore bins.

There is much prospecting in the upper portion of a large number of mines in this district. The inducements are greater, in that more ore is found nearer the surface, and the expense is trifling as compared with deep mining. Most of this work is being done by leasers. As the work of development in the mines of the district extends, the distribution of ore bodies and their relation to one another is better understood, and, as a consequence, strikes are of more common occurrence than heretofore.

The Gold Sovereign M. Co. resumed possession of their property, the lease held by the Cripple Creek Gold Temple Co. having expired. The last shots put in by the lessees revealed between 6 and 8 feet of ore which runs from six to twelve ounces in gold to the ton. The streak of rich ore is in a shoot 20 feet wide.

The leasing company has been given three days in which to take out the ore broken by the final shots, and then the Gold Sovereign will operate the property on company account.

F. Buck and an associate have subleased the Twin Sisters and Mohawk Belle properties on Raven hill and are pushing development on the claims.

Shortly after entering the Mohawk Belle the lessees struck ore of high grade, some of the assays showing \$1020 worth of gold to the ton. This was in a streak of limited width. Three or four feet of ore lying alongside the streak showed metal to the value of \$25 a ton under the same test. This was at a depth of about 145 feet.

F. Buck has leased two properties on Raven hill and is making preparations to put in a cyanide plant. The

ground is that known as the Twin Sisters and the Mohawk Belle, on the east slope, which he and an associate have obtained under sublease from the lessee. Fifty tons is the proposed capacity of the plant. It is calculated that treatment can be accomplished at a cost of \$1.50 per ton.

#### IDAHO.

##### Blaine County.

At the War Dance mines of the Wood River Zinc Co., Superintendent F. W. B. Johnson is surveying for the mill gradings. Accommodations have been completed for the men.

##### Idaho County.

The Moose Creek placers at Newsome creek, near Grangeville, have been sold by the Moose Creek Placer M. Co. to the Mercantile Finance Co. of Chicago. The negotiations were conducted by C. P. Richardson, president and manager, and T. H. Bartlett, secretary and treasurer, for the Moose Creek company, and T. Rhodus of Chicago for the Mercantile Finance Co.

A rich strike in quartz is reported from Newsome creek, and miners from Elk City, Four Mile and other nearby camps are staking out claims in the snow. It is said that a porphyry dike, known to be 30 feet wide and carrying values to the amount of \$10 per ton, has been discovered by J. Wells of Asotin, who has opened the dike on three claims and the values are found to be uniform the entire width of the vein. Neither wall has been found and the exact width of the vein is unknown, but the development work shows the ore for 30 feet and the assays indicate the values to be evenly distributed the entire width. Mr. Wells has been prospecting for this lead for months, and before the vein was opened he was working in placer ground. It was here that he commenced to dig and in a short time he found the vein of porphyry. In appearance the ore is very similar to the Hogan dike, but the values are much more evenly distributed.

E. McIntosh has gone to inspect the McKinley mine, near Lucile, with a view to putting in a mill. He will be associated with P. P. Weher of Wardner in furnishing the mill for the mine.

It is reported that by May 1 the Hogan cyanide plant at Elk City will be operating. The plant will have a capacity of 400 tons a day. The Thunder Mountain G. M. Co., operating 8 miles from Idaho City, will put in a 100-ton cyanide plant this year.—M. J. Sweeney plans work on the Syndicate group, 11 miles east of Elk City. Five men are now working at the property.—The Elk City G. M. & M. Co. will purchase a 50-ton cyanide plant.

##### Kootenai County.

The Panhandle Smelting Co. is to build a silver-lead smelter on Lake Pend d'Oreille which may be running in May with an initial capacity of 200 tons a day. W. D. Casseday of Minneapolis, Minn., is president, F. W. Guilbert secretary and H. M. Williams of Spokane, Wash., manager. Smelter buildings, including a furnace building, ore bins with a capacity of 4000 tons, sampler building and ore docks, which run out 2200 feet into the lake, have been completed. The smelting company is developing the Venezuela group of four claims near Lakeview.

##### Latah County.

The Gold Bug M. Co. of Garfield, Wash., has changed the main office from Garfield, Wash., to Princeton, Idaho. The principal stockholders are W. Westacott, L. W. Carson, J. W. Cox, G. F. Stivers, B. Westacott, L. E. Trowbridge, W. Duling, W. J. Tipton, A. P. Johnson and Mrs. J. Drew. It is said that this company is making preparations to carry on mining operations on their claims in the Hoo Doo district.

##### Leimhi County.

(Special Correspondence).—R. L. Edwards says that the Kittie Burton M. Co. will put in a cyanide plant to cost \$250,000 on their mine at Salmon. A 30-stamp mill is running at the mine, but a large body of base ore having been found it is thought necessary to put in a plant of 300 tons capacity. Koehler & Keating have begun the construction of a concentrator at the Fourth of July mine, 30 miles from Salmon. The ore is a high-grade silver product. A rock crusher and rolls will be used instead of stamps and about twenty-five tons a day handled.

Salmon, Feb. 7.

##### Owyhee County.

The Traders G. M. Co. of West Superior, Wis., working ½ mile below Dewey, have driven the main tunnel 850 feet, and are employing eight men. C. L. Nichols of Silver City has charge. G. W. Roberts, president of the company, has been visiting the property.

##### Shoshone County.

In the mines in the Coeur d'Alene district many improvements are contemplated this year.

Reports from Mullan are to the effect that the Snowstorm mine is shipping between 80 and 100 tons of copper daily from the district. In addition to the shipments sent to Tacoma, small lots are sent to the Butte and Anaconda smelters.

The Morning and You Like mines at Mullan, owned by T. L. Greenough of Missoula and P. Larson of Helena, Mont., are equipped with modern appliances. The plants required to operate these two mines are strung out over 4 miles. The concentrating mill is 2 miles from the mine, connected by a narrow gauge railroad. It has a capacity of 800 tons of ore per day and makes a close saving of values. The low water during the year was a great drawback, the mill being operated by water power when available, but is provided with an auxiliary steam plant for seasons of low water. The power at the mine is air, compressed by water power over 4 miles distant and piped to the mine. Larson & Greenough first operated the Morning and You Like mines as lessees and purchased the two properties in 1898. From January, 1898, to January, 1905, the mines produced 1,270,796,054 pounds of refined lead and 4,085,918 ounces of silver. For the year 1904 they produced 29,884,076 pounds of refined lead and 507,853 ounces of silver, for which they received 3½ cents per pound for lead and 58 cents per ounce for silver.

With the exception of the Tiger-Poorman, every concentrator in the Coeur d'Alenes was closed down during

the cold snap. Slush ice has given the mills the most trouble. The Last Chance concentrator broke a shaft and it was closed down for repairs, but has resumed.—The Standard and Mammoth mills were both closed down for a time. The Mammoth resumed, but the Standard mill remains closed. The Bunker Hill concentrator also closed. The Morning and Hecla mills are closed.

The dry ore belt in the Coeur d'Alenes lies south of the South Fork, between Placer creek at Wallace and Big creek, says the Press of Wardner. It consists of three large parallel veins, and some think them identical with the lead-silver veins at Wardner on the west and the copper deposits on Stevens peak on the east. Some of the oldest locations in the district are on the dry ore belt, and some of them have extensive development, showing up large and well-defined veins having either a low value in silver or carrying small stringers of rich gray copper ore. These results have encouraged the prospector, but have not been sufficient to interest capital. One of the best known properties on the dry ore belt is the Argentine, 2½ miles east of Wallace. Much development has been done and in the early '90s considerable ore was shipped. The ore in the Argentine, like that in other properties on that belt, is largely spathic iron, with low values in silver. There is a demand for this ore at the smelters and they take it carrying as high as 35% iron and treat it free of charge.

##### Washington County.

The smelter of the Ladd Metals Co. at Landore is running successfully, and turning out fifteen tons of bullion daily.

#### MICHIGAN.

##### Houghton County.

Ten thousand pounds of dynamite stored underground in a magazine at the eighth level of No. 3 shaft of the North Kearsarge branch of the Osceola Con. mine exploded on the 8th inst., killing several men, three of whom have been accounted for, and injuring many others. The force of the explosion was felt for miles around, and men working in other portions of the mine some miles from the explosion were knocked down. The cause of the explosion is unknown, and may never be discovered, as W. Pollitt Jr., the man who had charge of the powder, was killed, no trace of him having been found. It is thought that four or five other men are still in the mine. The Osceola Con. Co. will suffer a heavy financial loss.

#### MISSOURI.

##### Jasper County.

(Special Correspondence).—G. Burgess and W. E. Morgan of Joplin have sold their mines at Block City, known as the Transfer M. Co., to N. T. Cadle of Chicago, Ill. One mill is in operation and ore was developed in several drill holes. These will be developed. Prospects for several new mills in that locality are good.—J. Roach of Joplin has a good prospect of zinc on the Granby land in Leadville hollow. The miners are drifting on a big face of ore. Mr. Roach is arranging to erect a mill on his Granby holdings in the spring.—L. N. Dana of Joplin, superintendent of the Glendale diggings, has begun the erection of a new 100-ton mill on a shaft 2 miles south of Joplin. The mill will be provided with electrical machinery and will be in operation by June.—S. E. Loy of Aurora has bought W. McCullah's interest in the No. 3 mine on the Boston-Aurora ground at Aurora, where a large body of high-grade zinc has been developed. The mine is owned by S. E. Loy and G. E. Maxwell, who are figuring on the erection of a plant at that place.

Joplin, Feb. 6.

##### Lawrence County.

(Special Correspondence).—Superintendent G. Stratton of the U. Z. and Federal land, at Aurora, is soon to let a contract for sinking a shaft to develop the body of zinc ore recently found on the Federal land.—Sinking on the Coleman Bros. shaft on the Rohrherson land at Aurora, to tap the body of jack recently cut by the drill, is progressing.

An electric power plant has been finished at Lowell, Kansas, which was built to furnish power to the zinc and lead mines in the Joplin district. The owners of the plant are Chicago, Ill., and Joplin capitalists. The company is known as the Spring River Power Co., with headquarters in Joplin. Over \$1,000,000 have been expended in two large dams across Spring river at Lowell, which will furnish the power to generate electricity. Fully a hundred mining plants around Joplin, Galena and Wehch City have signed contracts to take power of the new company and preparations are being made to install electrical machinery for this purpose.

Aurora, Feb. 7.

#### MONTANA.

##### Fergus County.

Superintendent H. H. Lang of the Kendall mine, near Lewiston, says the most important work being done is in the shaft which will go to the 1000-foot level. The work is going on raising from the 500-foot level. Mr. Lang expects to reach the surface in another month. The shaft will then be timbered and the hoist set. In one year the shaft will be in operation to the 800 level and will be pushed on to the 1000 level, as it is there that the new ore bodies were struck by the diamond drills a year ago. These deposits are new and are as rich as the old body, upon which the mill has been running ever since it was started. The old ore body still has a large amount of ore in sight. The company has ordered a large amount of machinery. Some of it, including the cable, is already on the ground. A 150 H. P. electric hoist, a compressor and large sinking and station pumps will arrive soon. The Kendall employs 100 men, and they are taking out about 300 tons of ore a day.

##### Jefferson County.

E. B. Howell is president of the Green Campbell M. Co., operating the Green Campbell mine at Iron Rod, in Silver Star district. It is one of the oldest gold mines in the Northwest. It carries enough silver and copper to pay operating expenses. It produced good ore a quarter of a century ago and has been operated with varying success since that time. The main shaft has been sunk 200



feet and large excavations have been made at intervals from the surface to the bottom of the shaft. The company now has 2½ feet of shipping ore and 9 feet of milling ore. Shipments are being made at short intervals with good results. A stamp mill is now on the ground and will soon be erected. The mine is drained to a certain extent by other mines which have been opened up lower down the mountain side. A recent shipment of twenty-six tons of ore netted \$2100. The Silver Star mining district is one of the oldest quartz mining camps in Montana. Gold is the chief product, with silver and copper as by-products. The district is largely operated by leasers.

#### Madison County.

The Watseca mine, at Rochester, has been closed down, the pumps pulled out and only watchmen remain. The large volume of water to handle and low grade of ore are said to be responsible.

Adjoining the Watseca, E. Hand, formerly connected with the Watseca, has arranged for resuming work on the Champion property. The mine is owned by Mr. Brice of Ohio and others. The Champion is an extension of the Watseca on the south. The shaft has been sunk to 180 feet and the mine is supplied with a hoist and other machinery; work will be begun at once to get the property in shape for mining.

#### Silver Bow County.

The total dividends paid by Butte mining companies up to Dec. 31, 1904, are:

Boston & Montana .....	\$38,525,000
Anaconda .....	24,450,000
Parrot .....	6,002,785
Montana Ore Purchasing .....	3,780,000
Butte & Boston .....	1,800,000
United Copper .....	730,000
Colorado (estimated) .....	7,000,000
Alice, Lexington, Britannia and other companies .....	4,000,000
Total .....	\$86,807,785

The Amalgamated, up to Dec. 31, has paid its shareholders \$24,812,127.

The Anaconda Co. is adding 200 feet to the shaft of the St. Lawrence mine and the Boston & Montana is sinking 200 feet on the West Colusa. When the work is finished the workings of the former will be 2200 feet deep and those of the latter 1600 feet. This will give both companies a vast area of stoping ground and enable them to run another year or two without being required to go deeper. There is plenty of ore in the upper workings of both mines, but it is the policy of both companies to keep the work of exploration well in advance of the stope and level work.

W. McAndrews and T. Greeley were killed in the Rarus mine at Butte through the breaking of the cable, falling from near the surface to the bottom of the shaft, the men being dropped into 300 feet of water. The cable was flat and 8 inches wide and was supposed to be perfectly safe. The accident occurred without the least warning. There had been nothing wrong with the cable as far as known. The cage had barely left the surface before the cable snapped, sending the two to their death. The only explanation that is offered for the breaking of the steel rope is that the cable, wet continually, was probably attacked by the cold to the extent that the steel could not stand even the slightest weight, and the frost, getting into the rope, finished the work of the water.

### NEVADA.

#### Esmeralda County.

(Special Correspondence).—Wall & Mott of San Francisco, Cal., have bought the Vista Grande mines, in Bullfrog district, 80 miles from Goldfield, from Stanley, Busch & Manning.—A. E. Humphrey and Carleton Bros. have bought 160 acres of property south of the Combination.

Goldfield, Jan. 6.

M. D. Draper, consulting engineer of the Conqueror M. Co. at Goldfield, reports that the ore body of the Tonopah Cluh claim occurs as an auriferous shale, associated with gypsum and porphyry between a silicified rhyolite and a hornblende andesite. H. Weber and M. Ish are interested in the company. —The Sherman Goldfield M. Co. has bought stock in the Goldfield Lucky Strike M. Co. and will start development on the Lucky Strike claim under superintendency of J. R. Davis. —At a meeting of the assayers of the Goldfield district it was decided that after Feb. 1 the following rates would go into effect, subject to discounts of 10%, 15% and 20% on monthly work amounting to \$50, \$75 and \$100 respectively: Gold, \$1.50; gold and silver, \$2; lead, \$1.50; copper, \$3; control assays, \$5; umpire assays, \$10. —E. A. Montgomery intends to build a mill at Beatty to treat ore from the Shoshone and surrounding claims. A new road has been cut through from Coyote holes to Beatty so that the trip can be made from Goldfield to Beatty in a day.

#### Lincoln County.

At El Dorado Canyon, in the southern end of the county, mines are being developed systematically. Heretofore they have been worked in a haphazard manner by "chloriders." The group of the El Dorado M. Co. is to be started up, says C. G. Austin, the principal owner.

The Quartette mine at Searchlight has started three batteries at work. Pending the arrival of the new and larger engine this is the greatest number of stamps that can be operated, says the Searchlight. On the 700-foot level the west drift is in 60 feet and the ore body is unchanged. To the east there is being exposed what will probably prove to be the largest ore body so far developed in the mine. A crosscut is being run to the foot, but as yet the wall has not been reached.

#### Lyon County.

H. E. Miller, one of the owners of the Bluestone and Douglas copper mines, in Yerington district, is making arrangements to ship several thousand tons of copper ore from the Douglas mine to Salt Lake City, Utah, for reduction. There is considerable ore on the dump and when this is shipped miners will be put to work breaking more ore. A rate of \$5 per ton for transportation between Wahuska and Salt Lake City has been made by the railroad company and the reduction charges will be about the same.

#### Nye County.

(Special Correspondence).—In the Reville mining district, on the east slope of South mountain, the Last Chance group is being opened by tunnels and shafts. A double-track tunnel, starting on the Last Chance mine, is to be run north through the Liberty and Black Eagle of the Independence group. The formation is porphyry and limestone, with belts of quartzite cutting through at irregular intervals. The ore occurs either in the limestone near porphyry or between the two formations. The outcrops vary from an iron ore carrying lead and silver to a quartz silver ore. The Reville mining district is 55 miles east of Tonopah and covers an area of 6 miles. The silver ores occur in pockets and isolated deposits in dolomitic limestone near dykes and cappings of quartz. It was discovered in 1866.

Tonopah, Feb. 7.

The Nevada legislature has passed a bill removing the county seat of Nye county from Belmont to Tonopah.

Recent developments in the Midway mine at Tonopah are said to have opened a vein 10 feet wide of good ore. This strike is on the 435-foot level. The values are chiefly in silver. R. Condon is superintendent. Shipments have commenced.

In a well ½ mile west of Goldreed, water has been struck at a depth of 18 feet, and the water quickly rose 8 feet. The water strike is as valuable as the finding of shipping ore.

#### Washoe County.

W. H. O'Brien, representing Eastern capitalists, has a \$10,000 bond on a half interest in the Three Thieves, Fiddling Kid and Bull Dog mining claims, in Peavine district, near Reno. Development will be continued.

### OREGON.

#### Douglas County.

The Continental mine, on South Myrtle creek, is running with a full crew. Superintendent W. B. Stewart reports that as soon as the season is advanced ore will be shipped to San Francisco. He also expects that machinery will be put in to reduce the low-grade ore early this year.

#### Grant County.

Manager W. W. Gibbs of the Copperopolis property states that he has completed the west crosscut, striking the body of copper ore at a point 120 feet from the place where it had been previously crosscut.

Reports from the Black Butte mine, in Fox valley, 20 miles from John Day, are that the mill is at work on the best ore yet uncovered. The ore is of good value, 90% free and so soft and friable that large quantities are run through the mill. It is said the company will bring water from the head of Beech and Fox creeks by a ditch 10 to 12 miles in length, with the probability of a good deal of fluming. The work will be undertaken the coming spring.

### SOUTH DAKOTA.

#### Lawrence County.

(Special Correspondence).—The Golden Reward smelter is to be blown in soon, and in anticipation the company's mines at Ruby Basin and elsewhere are being prepared for output. These mines comprise upward of 20 miles of workings. The smelter was closed down two years ago because of a disagreement with the union. The labor organization would not recede from the demands made and the smelter shut down. It is the only plant in the county which can successfully treat the refractory "blue ores" in the Cambrian and Carboniferous deposits. The Montezuma and Whizzers mines, at Deadwood, which supply iron flux to these works, are also being put in condition to resume production by Manager J. T. Gillmore. The smelter when in operation employs a large number of men.

Deadwood, Feb. 5.

The Deer Lick mine is on Deer creek, 10 miles west of Deadwood. The shaft is 40 feet deep and will be continued as a large working shaft several hundred feet. An air compressor, hoisting engine, boilers, blacksmith shop, etc., will be put in. J. E. Waddell is president, J. C. Mills vice-president, W. Reed secretary and treasurer, F. H. Nash general manager.

### UTAH.

#### Beaver County.

The zinc mill of the Horn Silver mine is ready for operation, reports W. H. Peck, manager of the plant. The plant was built to handle 300 tons a day. It will be put into service gradually, but will be brought up to the maximum as rapidly as conditions will permit. The mill will cost close to \$100,000.

#### Juab County.

The ore shipments from Tintic for the past week are given by the Eureka Reporter as follows:

Name of Mine.	Carloads.
Centennial-Eureka .....	48
Bullion-Beck .....	5
Gemini .....	16
Grand Central .....	6
Mammoth .....	2
Carissa .....	6
Lower Mammoth .....	2
Victor .....	1
Ajax .....	2
Tetro .....	4
Uncle Sam .....	2
Eagle & Blue Bell .....	6
Yankee Con. .....	7
Hopes .....	1
Eureka Hill .....	2
Uncle Sam mill (concentrates) .....	2
Total .....	112

#### Salt Lake County.

H. W. Horne, consulting engineer of the Boston & Terrace C. M. Co., developing a group of claims on the west side of the Great Salt Lake, in what is known as the New Foundland district, has returned from a trip to that property and says conditions are favorable there for the opening of a good producer. A tunnel is being driven to what is known as the Shepherd lode and which shows up well where developed nearer the surface. The tunnel is now in 280 feet. The mine is 8 miles from New Foundland station on the Lucin cut-off of the Southern Pacific.

It is reported that the smelting concerns operating in

the Salt Lake valley have concluded that the only feasible means of eliminating the fumes, of which there has been much complaint in the Salt Lake valley, is by the use of a copious supply of water. The Utah Con. M. Co. filed with the State Engineer a claim for 25 second feet of water to be taken from the Jordan river, near the smelter, and to be conducted by an 800-foot pipe line to the smelter for use in the regulation and control of the poisonous fumes. The gaseous laden waters will be conducted into the Great Salt Lake for final disposal there.

#### Summit County.

A new hoisting plant may be placed on the American Flag mine, near Park City, as the present machinery is inadequate. J. G. Rhoden is manager.—It is reported that the Daly-Judge mill at Park City will be started February 14. J. J. Daly is manager.

### WASHINGTON.

#### Snohomish County.

The Wayside M. Co., near Index, propose further development, says Superintendent Carter. Work is progressing toward the erection of a 3500 H. P. plant, their plan being to place a wing dam in the Stillaguamish river, near Rohe, and running a flume to Hubbard lake, using the lake as a reservoir for feeding the turbines. With the completion of the proposed three-compartment shaft from the fourth level to the surface above the railroad track, the gravity system of handling ore can be used. Ore may then be raised to the surface, 200 feet above the railroad level, and pass through the various processes of sorting and stamping, to the Monte Cristo cars, obviating the present system of shoveling.

#### Stevens County.

The Jay Gould mine, 3 miles east of Chewelah, which has been idle for several months, has started, with D. F. Strobeck of Spokane in charge.

The Enterprise at Chewelah, owned by the Enterprise M. & R. Co., has begun operations under Manager T. F. Hertzell. The main shaft will be sunk to the 200-foot level and ore will be shipped from the ore body recently opened up.

The bond on the Silver Queen mine, near Kettle Falls, is to be taken up and a company has been organized to develop the property. The principal men interested in the company are E. D. Olmstead, D. J. Bissel Jr., H. F. Case, A. H. Palmer, A. V. Bradrick, R. K. Green, H. M. Lee and W. W. Warner of Spokane. The property was bonded by R. K. Green last November and has been worked steadily since. A ledge 40 feet wide was uncovered on the surface, in which there was an 18-inch streak of pay ore. This pay streak widened as depth was attained and at 85 feet pay ore showed a breast of 35 feet.

### FOREIGN.

#### BRITISH COLUMBIA.

The Silver-Lead Miners' Association of British Columbia, at a meeting held recently at Nelson, decided to submit to the provincial government a request that the present tax of 2% on the smelter proceeds of ore mined in the province be changed to a tax of one-half of 1% on the gross value. It is estimated that the proposed law would have produced \$75,000 in taxes during the year, instead of \$66,000, produced under the operation of the 2% law. A. C. Garde resigned as president of the association and was succeeded by J. Cronin, manager of the St. Eugene mine at Moyie. Garde was formerly with the Payne mine. J. L. Retallack was made a special commissioner to go to Ottawa to urge upon the Dominion Government the importance of the zinc industry and to secure an investigation of its conditions in the province.

#### Ainsworth District.

The Marion mine, near New Denver, owned by the Maritime M. Co., is to resume operations under the direction of C. F. Caldwell of Kaslo, manager of the Maritime Co., but under the immediate supervision of T. St. C. Brindle and J. R. Thompson of New Denver. They expect to begin shipping in a short time.

#### Boundary District.

The Morrison mine, at Deadwood, has been taken over by the Montreal & Boston Con.—The Bay mine, at Greenwood, has been handed from F. K. Hall and H. V. Fuller for \$60,000 by San Francisco, Cal., parties.

#### Nelson District.

The May & Jennie mine on Forty-nine creek, 10 miles from Nelson, is being equipped with a 12-foot Hendryx cyanide agitator, capable of treating fifty tons a day. The mine is owned by the Reliance G. M. & M. Co., managed by A. H. Kelly. The mill will be running April 1. W. J. Elmdorf of Spokane made the plans.

#### Rossland District.

The oil concentration process introduced by the Le Roi No. 2 mine at Rossland in October, 1903, is reported to be financially unsatisfactory, and the Le Roi mill is now running on straight water concentration. The Le Roi No. 2 is making a profit of 50 cents a ton with water concentration alone, whereas there was a loss of \$1.03 a ton when the oil process was used. During a seven months' test run the oil process treated 4578 tons of Wilfley tailings, which averaged .107 ounce in gold, .227 ounce in silver and .394% copper, or a gross assay value of \$3.23 a ton. The final tailings after treatment with oil contained .076 ounce gold, .135 ounce silver and .076% copper, or \$2.10 a ton. That meant an extraction of \$1.13 a ton through the Elmore section of the mill. The total milling operations showed a loss of \$1.03 a ton. Oil at first cost 40 cents a gallon and the consumption was three gallons to the ton; later the cost was cut to 29 cents a gallon and the consumption to 1.3 gallon a ton. Even with these changes, however, the Le Roi No. 2 management decided that the system was not a commercial success, as extra fine crushing was required by the Elmore process. By water concentration the grade of the tailings on the Wilfley tables has been cut to \$2.20 a ton, and there is no room for the profitable operation of the oil system. The Rossland Power Co. of Trail at first planned to use the oil system, but finally cut it out. The White Bear mine at Rossland is trying the process.



The net smelter returns of the Le Roi No. 2 for the year ended Sept. 30, 1904, were \$371,000; the total expenses were \$245,000; the net profits were \$125,200. The average value of shipping ore was \$24.80 a ton, made up as follows: Gold, .909 ounce; silver, 1.426 ounce, and copper, 2.37%. The cost of producing shipping ore at the Le Roi No. 2 was \$4.22 a ton, including sorting, covering a production of 23,020 tons of shipping ore, 10,331 tons of milling ore and 17,151 tons of waste. By allowing for depreciation of plant, and adding the cost of development, which included 1556 feet of drifting, 135 feet of raise and winze, and 3617 feet of diamond drilling (the last costing \$2.22 a foot), the cost of production was brought up to \$6.28 a ton.

#### Vancouver Island.

Thos. Kiddio, manager of the Tyee C. Co. smelting works, at Ladysmith, will put in hot blasts in place of cold in smelting. At the present the ore is first roasted, then smelted, with the results that the matte is about 45% copper. Ordinarily, when ore is treated in the smelter, 12% to 15% is the result, requiring a second treatment to bring the matte up to the 45% standard. Hereafter most of the ore treated at the smelter will be by the hot blast, and roasting outside will be done away with.

#### MEXICO.

##### Chihuahua.

(Special Correspondence).—In spite of the recent increase in treatment charges for the siliceous ore of the Parral camp, the production continues to be fair. The total tonnage of ores shipped to the smelters for the month of January was 13,006 metric tons, locally treated by wet concentration and leaching plants, 15,437 metric tons, held for future delivery 24,214 metric tons, a total of 52,657 metric tons.—One of the most active producers is the San Francisco del Oro, producing 4000 metric tons of shipping ore per month, and of late the profits have been so large that the company, an English syndicate, contemplates to erect concentrating and leaching plants to handle their second ores which are at present held on the dump. Large reserves have been opened up and the underground development work pushed more than in any other mine in the district. There are three grades of ore shipped at present, a siliceous ore carrying high-grade silver values, a lead-silver ore and zinky-lead-silver ore, but all of them admit a fair margin.—The El Refugio mine has not been sold, as frequently stated during the last month. An option for \$1,500,000, Mexican currency, was lately held by the Guggenheim Exploration Co., but the examination of the company's experts disclosed only net in sight \$660,000, Mexican currency. The mine at present is producing from shipments to the smelters and the lixiviation plant about \$25,000 net per month from the ore reserves above the water level.

The Los Muertos mine has been bonded and leased to the house of Hillforth, who are sending ore from the eighth level to the Parral M. Co. This district offers a field for a process handling low-grade siliceous ores running 15 to 20 ounces silver. The hypophosphite and Russell processes have proven too expensive and give low extraction, the extraction cost being \$9 to \$10 Mexican per ton, with 80% extraction, not including a large silver loss in roasting.

Parral, Feb. 5.

##### Sonora.

The Wisconsin-Mexico M. Co., operating the Plomosa, Iris and Oh'Gee mines, near Huepac, 125 miles north of Hermosillo, on the Sonora river, is building a stamp mill under the direction of R. Graham. The company have a 30-ton smelter, briquetting machines, etc.

## Commercial Paragraphs.

In equipping its new English shops where the steel cars for the London underground railway are to be built, the American Car & Foundry Co. has purchased from the Ingersoll-Sergeant Drill Co. its entire pneumatic equipment, including air compressors and Haeseler hammers and drills.

THE annual convention of officers and branch managers of Crocker-Wheeler Co. took place at the main office and works, Ampere, N. J., Jan. 26, 27 and 28. Managers and representatives from all parts of the country were unanimous in predicting a prosperous season during the coming year in the field of alternating current generators and direct current generators and motors. On the evening of the 27th a banquet was held at the Cafe Martin in New York, at which the president of the company, Dr. Schuyler Skaats Wheeler, presided.

THE A. S. Cameron Steam Pump Works, foot of East 23rd St., New York City, report the sale of three more of their horizontal piston pumps to the O'Rourke Construction & Engineering Co., of New York City, contractors, for the improvement in the Pennsylvania R. R. tunnel, delivery being made to the Manhattan side. The above named construction company also have a number of Cameron pumps in use on the Weehawken side of the Pennsylvania tunnel, and along the line of the improvement in the New York Central R. R. tunnel in New York City.

A 250-TON copper smelting plant for the Saddle Mountain M. Co., Kolvin, Ariz., is being furnished by the S. H. Supply Co., Denver. This shipment includes a 36x140 copper matting furnace, No. 7 Connorsville blower, hollers, engines, pumps, 125-foot steel self-supporting stack, steel dust chambers, slag pots, etc. This company is also furnishing twenty 900-pound rapid-drop stamps to the Bertha Consolidated M. Co., Idaho Springs, Colo., with plates, power and crushers, to be added to the twenty stamps now dropping, doubling the capacity of the plant.

THE General Compressed Air Co., 3933 Olive street, St. Louis, Mo., found in the past that the gasoline engines and air compressors necessary for use in their

house cleaning machines were not satisfactory for their purpose and they proceeded to manufacture their own engines and compressors. Those have proven so successful that they will establish a separate department to exploit these machines for other purposes. Their air compressors are manufactured for electrical and gasoline power, and are direct connected. They are also made portable. Literature will be furnished on application to the company.

VISITORS at the St. Louis Exposition will probably remember a model of a concentrating plant in the Missouri exhibit at the Mines and Metallurgy building. This exhibit was erected by the American Concentrator Co., Joplin, Mo., and at the close of the Fair was sent to the Raleigh school of mines. It is stated that eight other universities in the United States, Canada and foreign countries are corresponding with the American Concentrator Co. with a view towards having them build model plants of the same character for use in their educational institutions. A similar plant to the one at the Fair is under construction for the University of Iowa. The value of such equipment to the universities which have mining courses is apparent, and it certainly speaks well for the product of the American Concentrator Co.

## Books Received.

"Report of the California State Debris Commissioner," W. W. Waggoner, gives a resume of work accomplished on the Yuba and Feather rivers for two years ending Nov. 1, 1904.

Professional Paper No. 35, of the United States Geological Survey is "The Geology of the Perry Basin in Southeastern Maine," by G. O. Smith and D. White. Its most important conclusion is that there are no coal deposits in the area.

"California Mines and Minerals," Bulletin No. 35, of the California State Mining Bureau, by C. G. Yale, gives a review of the mineral production of California for 1903, comparing with previous production and detailing county production. A valuable part of the publication is the maps of every county in the State, showing all towns and roads.

"Bi-Monthly Bulletin of the American Institute of Mining Engineers," No. 1, is the first copy of an innovation by which papers heretofore distributed separately in pamphlet form to members will be issued in a single volume every other month. Besides a summary of the proceedings of the eighty-seventh meeting, Lake Superior, September, 1904, the following papers are printed in full: "Application of Dry Air Blast to the Manufacture of Iron," by Jas. Gayley; "The Influence of Carbon, Phosphorus, Manganese and Sulphur on the Tensile Strength of Open Hearth Steel," by H. H. Campbell; "The Gold Mines of San Pedro, San Luis Potosi, Mexico," by G. A. Laird; "The Zinc Smelting Industry of the Middle West," by H. C. Meister; "The Fire Clays of Missouri," by H. H. Wheeler; "Decomposition and Formation of Zinc Sulphate by Heating and Roasting," by H. O. Hofman; "The Coal Fields of Missouri," by B. F. Bush.

## Trade Treatises.

The catalogue of the Carterville Foundry and Machine Works, Carterville, Mo., and the Galena Iron Works, Galena, Kansas, W. G. Bryant, proprietor, is descriptive of crushers, Cornish rolls, friction hoisters, pumps, pipes, jig grates and jig supplies.

The Westinghouse Machine Co. of East Pittsburgh, Pa., has issued a neat brochure on the Westinghouse-Parsons steam turbine. In addition to presenting typical illustrations of the turbine and the plants in which it is operating, the pamphlet gives a valuable account of the principles and development of steam turbines. It gives 284 typical tests of the turbine as a strong argument for its use. The subject matter is clearly presented, the illustrations are good and the appearance of the whole is attractive.

## Obituary.

G. J. BARRETT, superintendent of the Blue Bird mine, died at Granite, Grant county, Or., Jan. 31st, from pneumonia.

D. L. MILLER, formerly superintendent of the Sierra Queen mine, in Nevada county, Cal., died Jan. 31st at Nevada City from injuries received in a cave at the Oustomah mine.

GEORGE BAUER, a prominent banker and mine owner of Mancos, Colo., died at Guadalajara, Mexico, Feb. 1. Mr. Bauer was born at Siegen, Prussia, in 1848, came to America in 1865, and six years later went West to seek his fortune. After prospecting with varying success in nearly every known mining region of Colorado he settled in Mancos in 1881, engaging in mercantile business and banking. He was also interested in mining, and developed a number of good properties in the La Plata mountains. He developed the mines now owned by J. Doyle, and at the time of his death owned principal interests in the well-known Comstock mine on the La Plata river. Mr. Bauer was justly called the father of Montezuma county, he having probably done more for the development of that region than all others combined, and was known and respected over the entire State for his ability, charity and inflexible honesty.

## Personal.

ALFRED HARVEY is on professional business at Velardena, Mexico.

J. B. BROWN is superintendent of the Ranier M. Co. at Warren, Idaho.

B. THANE is superintendent of the Eagle River Co. at Eagle River, Alaska.

R. S. EDWARDS is manager of the Kittie Burton mine at Ulysses, Idaho.

K. H. MCLEOD of Silver City, Idaho, is spending the winter in New York City.

I. C. BOSS is building a stamp mill for the Combination mine at Goldfield, Nev.

A. J. McMILLAN has been re-elected manager of the Le Roi M. Co. at Rossland, B. C.

AUSTIN JACKSON is superintendent of the Rocco Homestake mine at Hamilton, Nev.

E. F. GORDON has been appointed superintendent of the Hillside M. & M. Co. at Dixie, Idaho.

V. G. HILLS of Cripple Creek, Colo., is examining mining property in Boulder county, Colo.

S. M. SMITH is manager of the Greyhound M. & M. Co. in the Senfoam district, near Boise, Idaho.

J. MORGAN has been appointed superintendent of the South Kalgurli mine at Kalgoorlie, West Australia.

G. E. KILEY has returned to Denver, Colo., from Prescott, Ariz., where he has been examining mines.

T. C. GRAY, manager of the Valley Queen mine, near Granite, Or., has been visiting in Spokane, Wash.

A. C. JESKEY has charge of the development work at the Golden Star mine, near Quincy, Plumas county, Cal.

M. D. KELLY has succeeded M. B. Kerr as superintendent of the Jumper mine at Stent, Tuolumne county, Cal.

P. DERMODY is superintendent of the Providence mine at Providence, in the Boundary district, British Columbia.

W. F. ENGLEBRIGHT of Nevada City, Cal., has resigned as hydraulic engineer of the South Yuba Water Co.

H. L. CHAMBERLAIN has been appointed superintendent of the Florence Iron River Co.'s mine in the Menominee range.

J. H. MACKENZIE of San Francisco, Cal., is at Tombstone, Ariz., recovering from his recent severe attack of pneumonia.

F. E. WITHEY is general manager of the Grand Traverse & Arizona M. Co. at Cave Creek, Maricopa county, Ariz.

T. R. GRIFFITH of Breckenridge, Colo., has taken the management of the Mainstay M. & M. Co.'s property at Keystone, S. D.

A. E. DRUCKER, formerly with the Roosevelt M. Co. at Ludlow, Cal., is in the Montezuma mining district, Sonora, Mexico.

G. F. BARNES has succeeded F. Kingsbury as general manager of the properties of the Crown King M. Co. at Crown King, Ariz.

G. E. BAILEY, E. M., is in San Francisco, Cal., from a trip of several months on the Mojave desert in California and southern Nevada.

W. W. BRADLEY of Berkeley, Cal., has gone to Bodie, Mono county, Cal., to take a position as night foreman of the mill of the Standard Con. M. Co.

M. H. JACOBS, consulting engineer of Spear's American Exchange, has returned from the King mine in Owyhee county, Idaho, to Boise, Idaho.

AT a recent meeting of the Hidden Fortune M. Co. at Deadwood, S. D., J. P. Allison was chosen president, G. D. Begole secretary, T. J. Steele general manager.

MANAGER WARREN BOGUE, Utah branch Mine & Smelter Supply Co., now occupies his new headquarters, 121, 123, 125 West Second South street, Salt Lake City, Utah.

E. A. TAYS has resigned as manager of the mines and smelters at Maconi, Queretaro, Mexico, to resume his practice as consulting engineer at Fuerte, Sinaloa, Mexico.

S. KEELING of Kaslo has been appointed assistant to Lead Inspector G. O. Buchanan at the Sullivan smelter at Marysville, in the Southeast Kootenay district, British Columbia.

J. T. MORROW, formerly superintendent of the Boston & Montana M. Co. and general manager of the Cananea mines in Mexico, is now manager of the Guaynopita Copper Co. of Guerrero, Chihuahua, Mexico.

C. D. ACKERS has resigned as superintendent of the Hidden Treasure and Mountain Gate mines at Bullion, Placer county, Cal., to accept a similar position with the Taber M. Co. at Gibsonville, Sierra county, Cal.

E. C. WOOD of Spokane, Wash., has resigned from the management of the Minnehaha and Hercules mines of Washington, to accept a position as consulting engineer of the Essex Con. Mines Co. at Angels Camp, Cal.

H. E. KIRK has been appointed first assistant superintendent of the Cananea Con. Copper Co. at Cananea, Sonora, Mexico, succeeding C. S. McHenry who has resigned. J. Duffin has been appointed second assistant superintendent.



## Latest Market Reports.

SAN FRANCISCO, February 10, 1905.

## METALS.

**SILVER.**—Per oz., Troy: London, 28½d (standard ounce; 925 fine); New York, bar silver, 61½c, refined (1000 fine); San Francisco, 61½c; Mexican dollars, 51c, San Francisco; 47½c, New York.

**COPPER.**—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.50@15.50; Electrolytic, 1 to 3 casks, \$15.50; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £67 5s spot per ton.

The present outlook for copper during the present year is good, and in view of the probable increase in demand in the United States, due to increasing industrial activity, the output may be expected to be increased somewhat, but it is improbable that this increase in output will equal the increased demand. Should this prediction prove correct a still higher price than that at present quoted may be anticipated. Some statisticians who closely watch the market, and are familiar with all the important factors controlling the price, predict a decrease approximating 50,000 tons for export, which would undoubtedly force the price up in Europe, which will find a corresponding reflex in the United States.

**LEAD.**—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$4.60, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 17s 3d pig long ton.

**SPELTER.**—New York, \$6.20; St. Louis, \$6.30; London, £24 15s pig ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

**TIN.**—New York, pig, \$29.25@29.50; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, 32½@35c. London, £131 5s spot.

**PLATINUM.**—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

**QUICKSILVER.**—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

**BABBITT METAL.**—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c. **SOLDER.**—Half-and-half, 100-lb. lots, 19.50c; San Francisco, Plumbers', 100-lb. lots, 16.25c.

**ZINC.**—Metallic, chemically pure, 50c; dust, 7½c, 10c; sulphate, 7½c, 10c.

**NICKEL.**—New York, 55@60c per lb.; ton lots, 40@47c.

**ALUMINUM.**—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

**ALUMINUM.**—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

## STRUCTURAL MATERIALS.

**IRON.**—Pittsburg, Bessemer pig, \$16.85@17.10; gray forge, \$16.85; San Francisco, bar, 3c per lb., 3½c in small quantities.

**STEEL.**—Bessemer billets, Pittsburgh, \$25.00@26.00; open hearth billets, \$25.00@26.00; San Francisco, bar, 7c to 12c per lb.

**WHITE LEAD.**—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

**LUMBER.**—(Retail): Pine, ordinary sizes, \$24.00@25.00; extra sizes higher; redwood, \$28.00@30.00; latb, 4

feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

**NAILS.**—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

**LIME.**—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

**CEMENT.**—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 per bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

## GENERAL SUPPLIES.

**ANTIMONY.**—New York, Cookson's, 8½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

**COAL.**—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton: Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

**POWDER.**—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

**CAPS.**—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

**FUSE.**—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

**CANDLES.**—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

**CHEMICALS.**—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@24½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; bysulfate of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

**BORAX.**—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

**BONE ASH.**—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

**LITHARGE.**—Pure, in 25-lb. bags, 8@9c per lb.

**MOLYBDENUM.**—Best, \$2.75 per lb.

**CHROMIUM.**—90% and over, 80c.

**PHOSPHORUS.**—American, 70c.

**SILVER.**—Chloride, 90c, 90c@1.00; nitrate, 55c.

**RED LEAD.**—500 lbs. and over at one purchase, 7½c; less than 500 lbs., 7c.

**MAGNESIUM.**—Pure, N. Y., \$1.60.

**MANGANESE.**—Per lb., \$2.75.

**SODIUM.**—Metal, 50c.

**BISMUTH.**—Subnitrate, 2½c.

**URANIUM.**—Oxide, 7½c, \$3.50.

**MERCURY.**—Bicbloride, 7½c, \$1.25.

**TUNGSTEN.**—Best, 7½c, \$1.25.

**FIRE BRICK.**—Domestic, carloads 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skew back, \$30.00; circle, \$32.00.

**FIRE CLAY.**—Domestic, 1 ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market Street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JANUARY 31, 1905.

781,123.—NEWSPAPER WRAPPING MACHINE—J. L. Boyle, Harrisburg, Or.  
781,181.—TELEPHONE MOUTHPIECE—W. K. Brackett, Alameda, Cal.  
781,591.—RAZOR STROP—J. S. Burk, Prosser, Wash.  
781,331.—OIL BURNER—J. H. Davis, Oakland, Cal.  
781,501.—DOOR SECURER—W. P. Dohson, Grants Pass, Or.  
781,085.—LOCK—A. O. Fossum, Tacoma, Wash.  
781,284.—OIL BURNER—S. T. Johnson, Vallejo, Cal.  
781,534.—JAR COVER—J. A. Landsberger, Alameda, Cal.  
781,614.—CONVEYER—W. L. McCahe, Seattle, Wash.  
781,543.—STREET CLEANER—D. G. McClay, Santa Ana, Cal.  
781,093.—HYDRAULIC WEIR—W. S. Post, Los Angeles, Cal.  
781,361.—DOOR CLOSER—O. Rice, Oakland, Cal.  
781,085.—LOGGING APPARATUS—H. E. Robertson, Portland, Or.  
781,096.—LOGGING APPARATUS—H. E. Robertson, Portland, Or.  
781,369.—HAT HOLDER—W. L. Scott, San Francisco.  
781,240.—RENDERING OILS LIMPID—E. A. Starke, Alameda, Cal.  
781,242.—MANUFACTURE OF GAS—J. C. H. Stut, Oakland, Cal.  
781,380.—MANUFACTURE OF GAS—J. C. H. Stut, Oakland, Cal.  
781,243.—FOLDABLE TRUCK—S. Thompson, Eureka, Cal.  
781,477.—HATCH COVER—T. Walker, Portland, Or.  
781,528.—CAR BRAKE—H. H. Warner, Tacoma, Wash.  
781,253.—KNITTING MACHINE—C. D. Whitcomb, Glendora, Cal.  
781,255.—FIRE BRICK—F. A. Widdows, Stockton, Cal.  
781,262.—VEHICLE WHEEL—Z. Wevers, Santa Cruz, Cal.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

**METHOD OF RENDERING ASPHALTIC OILS MORE LIMPID.**—No. 781,240. Jan. 31, 1905. E. A. Starke, Alameda, Cal. This invention relates to a method for reducing the viscosity of heavy crude oils and particularly oils of asphaltum base. The object of the invention is to so treat the heavier asphaltic oil that, while retaining all its original constituents, it will be rendered permanently limpid, and thus in condition to be transported through pipe lines, etc. It consists in a process and apparatus adapted to bring about the desired result.

**OIL BURNER.**—No. 781,331. Jan. 31, 1905. J. H. Davis, Oakland, Cal. This invention relates to improvements in liquid and gaseous fuel burners designed for use particularly in stoves and grates. Its object is to provide a cheap, simple and practical burner for heavy oils which may be applied to stoves or furnaces already in use, which is not apt to carbonize, which will permit a regulation of the amount of heat, and which will produce a steady, broad and smokeless flame. It consists of necessary construction and combination of parts adapted to bring about the desired result.

**TOILET AND HAT HOLDING APPLIANCE.**—No. 781,369. Jan. 31, 1905. W. L. Scott, San Francisco, Cal. The object of this invention is to provide a device or appliance which is especially convenient for travelers, those visiting theaters and like places of public gathering, and for such purposes as it may be conveniently adapted for. It consists of a support, a hook carried upon one end, a hinge member upon the opposite end, a segmental yoke having its segmental portion forming the other member of a hinge, said yoke being substantially semi-circular in form and having interturned ends, a rim having holes diametrically opposite with which the ends of the yoke engage and form a pivot about which the rim is turnable, a mirror carried upon one side of the rim and a convex cushion carried upon the other side, and other details of construction.

**FOLDABLE TRUCK.**—No. 781,243. Jan. 31, 1905. S. Thompson, Eureka, Cal. The object of this invention is to provide a light, handy, compact, durable, practical truck for the use of expressmen and others in the easy handling of trunks, boxes and like bulky packages, and which truck can be folded into small compass and stowed into a wagon, and which also can easily be run over carpets or polished floors without danger of injury to the latter.

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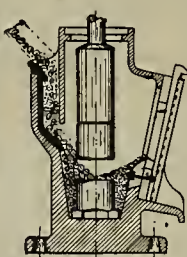


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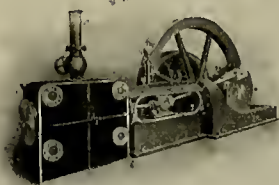
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## Seeking a Mining Method.

Not infrequently the mine superintendent casts about for a method by which he can extract a given body of ore at the least expense. In most cases the most economical method is the result of improvement from time to time on the various methods tried. The main consideration is economy, but this is not the only important matter to consider in deciding upon a mining method applicable to some unusual condition. The chief consideration, it is admitted, is usually expense, and this it is desirable to reduce to the lowest possible point compatible with other considerations, mainly the safety of the men and the recovery of all the ore. As few ore bodies can be mined without more or less preliminary and preparatory expense, it is desirable to extract as large an amount of the ore in the vein as possible. The factors which cause unusual expense are very hard or very soft ground; bad walls; abundance of water below a natural drainage level; scarcity of timbers; the low dip of the vein—too low for the rock to "run" when broken in the mine; difficulty of approach to the ore body, owing to rugged topography of the country; high wages. Each of these is a factor in increased expense over a normal condition, and some mines have several of them to contend with. No rule can be laid down as the best to follow, for each case must be treated in accordance with the existing conditions. Where a large vein has a low dip— $20^{\circ}$  to  $30^{\circ}$ —it may be advisable to open the mine through the medium of an inclined shaft sunk in the foot wall of the vein, in

preference to a crosscut tunnel driven in on the level. When such a tunnel strikes the vein the facilities may be as good as it is possible to make them, and these conditions may be taken advantage of for a distance of 200 or 300 feet back toward the mouth of the tunnel, but farther than that the raises necessary to connect the crosscut with the vein, and the methods of handling the ore in the stope, become disad-

vantageous, and the tunnel then is the cause of increased rather than diminished expense. Where the mine is opened through an incline sunk on the foot wall of the vein, or in the foot wall country rock, which latter in many instances is preferable, as it admits the construction of ore pockets under the level, and every portion of the vein is accessible throughout the entire depth of the shaft, to the extent of its relation to the shaft on the strike of the vein. The cutting out of ore pockets will greatly reduce the expense of handling ore, as all that is broken above the level may be trammed to the station and dumped, where it can be loaded into the skip from chutes at minimum cost. The shaft, being in the country rock under the vein, is permanently located, and, to avoid the effect of heavy blasting in the stopes above, it is advisable to place the shaft at least 20 feet lower than the vein. The ore pockets reach from the foot wall of the vein to the back of the shaft, having the vertical side facing the dip of the vein. Skips lowered beneath the chute door may then be readily filled, no matter how flat the vein above. If filling is required, as it must be, unless the vein is worked by room and pillar method, a winze should be sunk in the hanging wall country from the surface. The filling may then be obtained on the surface from open cuts, by the mill hole method, provision being made to drain away any water falling or running into the open excavations. This rock shaft need not be placed directly above the working shaft, but at some distance away on either side. These preliminary arrangements completed, mining may proceed at various levels, the amount of timber used being determined by the standing qualities of the walls and the ore itself. Proceeding thus, all the ore should be recovered.



Ore Washer at the Abe Lincoln Mine, Cripple Creek, Colo. (See page 102.)



The Sorting Belt at the Last Dollar Mine, Cripple Creek, Colo. (See page 102.)



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## Trials of the Millman.

The pathway of the millman is not always strewn with roses, nor with appreciation of his efforts. There are often instances when the mill foreman is aware that the saving being made under his supervision is considerably below what it should be, though as close as can be accomplished with the means at hand. It is no new thing to see a mill built in what the designer styles modern, up-to-date fashion, but when the practical millman takes charge of this mill and endeavors to do good work he finds himself unable to do that which he knows should be done. The ore may be of such a character that it is impossible to make a high saving without special apparatus, and this the mill does not possess, and while the necessary addition could readily be made, the owner does not consider it necessary, and either refuses or neglects to provide it. The millman has to contend with roughly taken headings samples, which may run high or low, as the case may be, for him and hopper samples vary greatly in a mine where the values are not evenly distributed. If the mill output exceeds the call of the headings samples, well and good; but if it falls below the amount called for by these head samples, taken from cars, bins and hoppers, there is trouble for the millman. Take the instance of a large operating mine. The ore consists of quartz, schist, slate, talc, veins of hard mineral and zones of soft, with more or less crushed and talcy gouge. The values cover a wide range, from a dollar or two per ton to specimen rock; sometimes there is a high percentage of free gold, at other times the values are largely in the sulphides. Here head samples necessarily must vary. So, too, will the samples taken below the plates, and also below the concentrators, unless proper means be supplied to treat the ore. The water supply and power arrangement may be defective and not constant, which must have a direct influence on amalgamation and concentration. Under such conditions the millman should be selected for his known experience and then given carte blanche to make any necessary changes in the mill that his experience suggests.

When such conditions as above outlined are found—and such actually exist, both in mine and mill—the battery must have a constant supply of water, under a fixed head, or good work can not be done either in amalgamation or on the concentrators. The crushing of the ore will result in the creation of a relatively small amount of comparatively coarse sand, depending on the screen and height of discharge, and a large percentage of slimes, and this applies to sulphides as well as gangue minerals. Close concentration of such material is impossible without classifiers, which will send coarse material to one machine and slimes to another. An absolutely unvariable speed of machines, as well as even water supply, is indispensable to good work, for when the machines are adjusted to slow speed, say, 160 revolutions per minute—a speed generally too slow—and fairly good work is being done, and then the machines speed up to 200 revolutions, because of increased water pressure at the wheel; the sand will be carried over with the sulphides and dirty, low-grade concentrates result. If adjusted to 200 revolutions and the motive power is disturbed, so that the machines slow up, high-grade concentrates may result, but high-grade tailings also. Therefore, it is imperative that such arrangements be made as will insure a uniform speed of the machines and a uniform supply of fresh water, distributed from a tank where the pressure will be constant. The machines should be always run by a special wheel; but it is not enough to provide this if the water pressure can not be kept constant. So important is it that the concentrating machines be run at uniform speed that some millmen devise ingenious methods of equalizing their speed by the use of cone pulleys and other devices, with large dials or other indicators which at once attract attention if the machines run either too fast or too slow.

FOR months past the oil producers of the State of Kansas have been at war with the Standard Oil Co. and the transportation companies over the handling of the oil output in that State. The climax has apparently been reached by the passage of a bill by the Legislature of Kansas appropriating \$410,000 to build a refinery in which to treat the oil output of that State, the labor to be performed by convicts.

Action taken by the Oil Producers' Association of Kansas has resulted in the introduction of a resolution in the House of Representatives requiring that the Secretary of Commerce and Labor investigate the causes of the low price of crude petroleum, particularly in the State of Kansas, and to inquire into the reason for the great difference in the price of the crude oil and the refined product. If the Kansas oil producers gain their point, it will probably have the effect of inducing the oil producers of other States to attempt to do likewise.

## Gold From the Sea.

At Bryon hay, New South Wales, Australia, the most extensive and costly plant ever built to operate the old-time "fake"—that of extracting gold from sea water—has lately been completed. As described by the Town and Country Journal, it comprises a basin connected with the sea and having a capacity of 40,000 gallons. It is supplied with a high-tide inlet pipe and a low-tide outlet pipe, each provided with a valve. At high tide the gold-bearing water is allowed to run into the tank where the operation of ostensibly extracting the gold is gone through, and at low tide the non-auriferous tailings water is allowed to escape into the ocean again. It is calculated to treat 18,000 gallons per day, and an extraction of  $\frac{1}{2}$  grain, or about 2 cents per ton, it is claimed, will yield a profit. The cost of this outfit thus far is said to have been nearly \$15,000. It is the intention to cover the bottom and sides of the tank with canvas. After a tank of water has been discharged there remains on the floor and sides of the tank a coating of sediment, which will be pumped up to a tank and the cyanide process in some form applied and the gold recovered. All the power required about the plant is furnished by the waves, and, as the operations are largely automatic, the expense will be very low. As the sea water is supposed to contain from 5 to 10 cents per ton, the manipulators can figure a handsome profit on paper. This old-time swindle has been operated in various parts of the world in all sorts of guises at intervals for many years past. Many devices calculated to impose on the ignorance of the public generally have been devised, such as evaporation of the water and separation of gold from the mineral salts, electro-plating the gold on copper plates suspended in the water, precipitation of the gold by ferrous sulphate and other equally visionary schemes, which would be likely to appeal to the credulity of those seeking investment; but this last effort surpasses in boldness and magnitude anything yet attempted in this direction. It is strange that the proposition has been permitted to advance so far in a country where the mineral production is under such strict Government control.

THE metal miners of the Rocky Mountain and Pacific Coast States usually build substantially and well, but it is not always necessary to go to great expense, in construction, particularly such as is often seen in the West. Prospectors build cheaply, usually, proving that elaborate works are not always required, but with working mines it is generally considered that a frail appearing structure is contrary to the best interests and needs of the property. In the zinc-lead districts of Missouri, there are scores of mines equipped with frail-looking head frames, of what in the West would be considered unique design, but these frames are found to answer every purpose, are inexpensive, and made of lumber in which the largest pieces are not above 8x2 inches. They are easy of construction and require no particular architectural or engineering skill, and are not built on scientific lines, but they cost little and do the business—and this is the main thing after all.

THE attempt to secure the passage of an eight-hour bill affecting miners, mill and smelter men in Colorado has met with strong opposition and will probably be amended, if passed at all, so as to not materially affect miners and metallurgical workers. The experience of the past year has not been forgotten, nor is it likely to soon be. All engaged in the mining industry in that State are earnestly hoping for continued peace and prosperity, and this sentiment is clearly reflected in the acts of the Legislature.

THE average young American mining engineer usually has a desire to leave his native country, to go into distant lands, where he may be a pioneer, and distinguish himself by overcoming great difficulties, earning fame and fortune. The idea is suggested, no doubt, by the success of a number of American engineers who went abroad and earned the much sought after fame and fortune; but the greater number of these men—all, in fact, who have made great success—had previously distinguished themselves at home, where there were difficulties, both mechanical and metallurgical, to overcome, and who had already learned their lessons in the hard school of experience after leaving the university. There are the same opportunities existing to-day—mines in situations remote from railroads and where conveniences are few, where special mining methods must be applied and metallurgical experiments made. Despite the advanced stage of knowledge of mining and metallurgical science, mistakes appear to be of as frequent occurrence to-day as ever they were in the past. There is no need of a young American engineer going to Africa, to China, to the deserts of Australia, or to the towering mountains of South America, so long as so much remains to be done in the United States. There are important questions to be solved in the economy of mining and metallurgy in every Western mining State—new districts to develop, new methods to discover and apply. The problem of smelter fumes is in itself a matter to engage careful attention. The fumes can be allayed in most instances by well-known processes, but to accomplish this without increasing the expense of smelting, and to find a market for the several by-products of these extraordinary operations, is something to ponder over. In some districts metallurgical methods which will cheaply extract sufficient values from complex ores to afford a profit are greatly desired. There remain and are constantly occurring unsolved problems everywhere, and to these the young engineers should give their attention.



## CONCENTRATES.

COPPER silicate when roasted with sulphide of iron results in the formation of copper sulphide and iron silicate. When heated with metallic iron, silicate of iron and metallic copper result.

FLOODED mine workings may sometimes be tapped with safety from adjoining workings by means of bore holes, though there is always an element of extreme danger present, particularly when the column of water is high.

WHILE the mining law may be construed liberally, and the courts usually favor the bona fide locator, there is no disposition on the part of the courts to shield a locator who neglects to perform his assessment work as required by law.

SULPHURIC ACID may be made from the roasting of sulphide ores and the copper leached from the roasted sulphide copper ores by means of dilute solutions of sulphuric acid, but this process is complicated and involves many chemical reactions. The process may be applicable in some such manner as suggested, but that it would prove commercially successful is less certain.

WHERE an association or company locates 160 acres of placer ground in one claim, as provided by law, only \$500 worth of work or improvements is required to proceed to patent, and this labor or improvements may be made at the option of the claim holders, within a week, or may extend over a period of five years, until the necessary work has been accomplished as annual assessment work.

ANTIMONIAL ores carrying gold and silver are difficult to treat, for the reason that roasting is usually required, and the fact that antimony fuses at a comparatively low temperature renders this difficult. Successful roasting of antimonial ores can be accomplished by treating the ore several times at moderate heat between 400° and 700° F. This gradually volatilizes the antimony and sulphur and the ore is finally brought to a proper condition for further treatment, by either wet or dry process.

THE best way to test rock supposed to contain gold is to pulverize it in a mortar, first thoroughly cleansing the mortar and pestle to avoid being "salted" by rich rock which may previously have been crushed in it. If the ore contains sulphurets, crush and concentrate in a pan or hornspoon, dry and roast to a red heat to burn out sulphur. No need to use salt in roasting. Grind in a mortar and pan as with quartz. As with the latter, if no gold is obtained on carefully washing, have the ore tested by reputable assayer.

WHEN it becomes necessary to place timbers in a shaft lined with masonry, to carry guides, ladders, etc., the ends of the main timbers may be set in the masonry; but in time they will rot, and the work of replacing them will be more expensive than if the square-set method of placing and wedging the timbers he employed. The engineer in charge of this work should be able to judge from conditions in neighboring mines of the probable life of timbers under such conditions and the economics of the situation studied out.

IN constructing gravity tramways it is customary, where possible, to give the upper end of the line a heavier grade than the lower portion in order that the loaded car may start the empty one up more easily. Such tramways are usually run on a brake, or the cars descending would get beyond control. In some instances ore is sent from a dump above a mill to the mill through a steel pipe 15 to 20 inches in diameter. Provision must be made at the lower end to receive the ore and prevent it doing damage to the mill. It is best to keep a chute of this description filled at the lower end.

WHERE it is necessary to change the angle of dip of a shaft, whether from vertical to inclined or from one degree of inclination to another, the curve should be of sufficient radius to avoid "shock," when the skip or cage reaches the curve, or the vehicle may leave the track—particularly where fast running is the rule. Where conditions are such that the change cannot be properly made, it is better to put in a guide to keep the wheels from leaving the track. Angle iron is useful for this purpose. The guide rail is turned up slightly at its upper and lower ends, to prevent the wheels from striking upon entering the space between the main rail and the guide rail.

WHERE the location of a quartz claim takes more than 1500 feet on the vein or lode—the amount permitted by the statutes—whether the excess be at one end of the claim or at both ends, a subsequent adjoining locator may place the stakes of his claim at the distance from the senior locator's discovery shaft claimed by the latter on his location notice. Thus, if A claims 500 feet north from his location stake and 1000 feet south from the same stake, he can take no more than the distance

stated, and should he place his north end stakes 600 feet from the discovery stake (claiming but 500), B may come to within 500 feet of A's discovery stake and locate his south end line.

THE copper of the world results from four sources: Native copper, produced chiefly by the mines of the Lake Superior region; from sulphide ore by smelting in blast and reverberatory furnaces; by the smelting of oxidized ores in blast furnaces, and by the leaching of the metal from natural and artificially oxidized ores by one of several processes. The largest leaching operations are carried on in countries where labor is comparatively inexpensive, but the same methods are applicable to similar ores everywhere. The ores treated by the leaching method are uniformly low grade, it being more economical to smelt the higher grade ores, whether oxidized ores or sulphides.

WHEN high-grade values, in the form of slimes, are carried over the tail end of the concentrating machines the problem of saving them becomes difficult, as it involves the necessity of separating the solid from the fluid portion of the tailings. At some works this is attempted by running the tailings over canvas plants, and sending the final water to settling tanks where the rich slimes again appear floating on the surface. The overflow from these tanks is then conducted through a pipe and discharged into another tank under water, when the microscopic particles now completely submerged settle to the bottom, unless the current be so strong that they are brought to the surface again by the agitation. This may be guarded against by making the lower settling tank sufficiently large to prevent it.

WHAT is known as the longwall method of mining coal is seldom applied to metal mines, though there are probably numerous cases where this method might be applied to advantage. By its employment the entire contents of a flat vein, not too thick, may usually be safely mined. Its success depends upon the caving of the roof a few feet back of the working face. The roof of coal seams is well adapted to this method in many places, but not so the hanging wall of metalliferous veins. In the latter the hanging wall usually stands very well or very poorly, and in the former case, if unsupported, often eventually falls when not expected and causes fatalities which might have been avoided. The caving of large masses of rock, even in stopes which have been abandoned, should be prevented if possible, as the concussion may result in disaster in other workings connected with the caved stope. Where timbers can not be afforded, it is often better to work by the pillar and room method, by means of which from two-thirds to three-fourths of the ore may be safely recovered. After this method has been safely employed, an attempt is often made to rob the pillars, and sometimes this is attended with disastrous results.

A WIRE hoisting rope is not equivalent to a solid bar of iron or steel of the same size. About one-quarter of the sectional area is occupied by voids and three-fourths by the solid metal. Plough-steel wire, from which the best hoisting ropes are made, is estimated to have a breaking strength of from 190,000 to 300,000 pounds per square inch. In determining the breaking strain of a hoisting rope the manufacturers do not usually claim more than 60% of this ultimate tensile strength and place the safe working load at about one-fifth to one-sixth that of this assumed safe breaking strain. Thus a hoisting rope of 1 inch diameter should not break under a strain of less than 140,000 pounds—the manufacturers place it usually at 88,000 pounds (forty-four tons), and fix the safe working load at 8.8 tons. This is necessary owing to the extraordinary strains due to sudden starting of the load, or the sudden stopping when the load is in motion. In such cases the strain is sometimes from eight to ten times that of the load. A rope is always at its best when new and from the beginning of its use it commences to deteriorate. Ropes in wet mines deteriorate much more rapidly than in those which are dry, as the moisture is constantly present within the core of the rope and the tendency to rust is thereby increased, particularly on the end of the rope next the skip or cage. For this reason hoisting ropes should be thoroughly and frequently lubricated with a proper grease or oily substance which should be put on hot so that it may penetrate to the center and protect every portion of the rope, within as well as without. Crude petroleum is used at some mines with satisfactory results. It is easy of application and lasts well if the oil is not too light. In mines where the water is charged with acid, as in many copper mines, even greater care must be exercised than elsewhere.

A PLACER LOCATION made by an association of eight persons may include 160 acres, or any less number, and such location (say 160 acres) constitutes one claim. The Federal statutes require that the individual locator of a 20-acre tract must perform \$100 worth of work on his claim annually, but a location made by an association of individuals embracing more than twenty acres may undoubtedly be held by performing the same amount of labor on it as is required on the 20-acre claim of a single individual. There is an important distinction, however, between an association claim of 160 acres taken as such by eight individuals, and the consolidation of eight locations which have been taken up as eight separate claims.

It may seem unjust that the association claim of 160 acres requires but \$100 worth of work, while a consolidation of eight claims into one company requires \$800 worth of work, but such is the law. Work need not be done on each 20-acre tract of a location embracing 160 acres made by an association, for the appropriation of 160 acres by eight associated persons is accomplished by one location. An illustration of another phase of this portion of the mining law is found in the fact that a quartz claim 1500x600 feet requires \$100 worth of annual labor, but a fractional claim of much smaller dimensions requires as much labor as a full-sized claim. "The volume of work," says Lindley on Mines, "is not gauged by the size of the claim located. There is no sliding scale adjusting the matter according to area. In determining, therefore, the amount of annual work to be performed in connection with an aggregation of locations, each location is to be considered as a claim within the meaning of the law, regardless of the superficial area comprised in any one or more of them."

IN the case where A, a corporation, owning a group of claims upon which assessment work had been done up to Jan. 1, 1904, but no work or improvements made during 1904, the claims become subject to relocation Jan. 1, 1905. The fact that B was told he might relocate them gives B no legal rights in the premises, unless he was given written notice of abandonment by the company, the same being an official act of the board of directors, duly signed by them and the president. Without it B could not probably hold the property should the company seek later to dispossess him, as they might in the event of his making a strike. A held the claims by permission of the Government under the terms of the Federal mining statutes, which require A to comply with the requirements of the statutes or lose the claim by forfeiture. Having failed to comply with the statutes, A has no rights in the matter after Jan. 1, 1905, as the claims then reverted to the public domain on that date and were then subject to relocation by any other citizen. The only manner in which B could have secured any rights would have been under the original location, by beginning assessment work during December, 1904, and continuing the work until completed. C, in relocating the property, does so in accordance with the law, and unless B has the formal official notice from the company above referred to, C would be the only one having a legal right to the claims at this time. Had A been an individual, instead of a corporation, it would be somewhat different, and the intention of abandonment would be strengthened by the removal of surface improvements; but corporations are required to do all acts in a formal manner through its duly constituted officers. D, who relocated the claims Dec. 16, 1904, has no rights whatever, as he probably neither had the written consent of the company nor the right to appropriate the claims before Jan. 1, 1905.

THE fact that some portions of a vein are accompanied by a selvage or gouge, while other portions are "frozen" to the walls, is not always easy of understanding, though several explanations have been advanced to account for this phenomena in certain cases. The most reasonable theory, perhaps, is that the country rock adjoining veins is usually divided into large wedge-shaped blocks, and some of these blocks may be caused to move in one direction or another by the stresses which are constantly occurring within rock masses, while other blocks are not subjected to these movements to the same degree, or possibly not at all, and selvages, consequently, are not formed. Rocks are elastic, and admit of considerable bending without fracture if the pressure is exerted so slowly as to admit of a readjustment of the molecular structure of the rock. The movements of vein walls are various, for the striations found in one portion of the mine often do not agree in direction with those in another portion. A change of dip or strike in the vein would produce this condition in the event of movement in the walls occurring. In some places there are evidences of movements having occurred at different periods in different directions, which is also indicated by the striations on the walls crossing each other. Owing to these inequalities in the surface of the vein plane, one portion of the wall would be subjected to greater movement than other portions. Movements, which in one part of the vein results in selvage or gouge, may be dissipated by the fractures extending into the walls. In many instances the movements which have produced the selvages at the side of the vein have taken place since the formation of the vein, and the movement producing the selvage along one part of the vein has caused a fracture in the wall following some line of weakness, offering less resistance than the plane of the vein itself. In that portion of the vein beyond this branching off of the break the vein is found "frozen" to the walls. There are other conditions which might produce these results—mostly of a mechanical nature, and some, also, of a chemical nature. Some veins have two good walls with selvages or "let go" in one portion, a single clean wall in another, and no walls at all in a third. In some cases it is known that the portion of the vein having two walls is due to the prior existence of two parallel, or nearly parallel, fissures between which the mineralization took place. In the case of one wall, the mineralization occurred on one side of the fissure only, and in the case of "frozen" walls, the mineralization has occurred on both sides of the fissure and completely obliterated the fissure by replacement of the original material by quartz and other vein materials.



## The Mother Lode in Amador County, Cal.

Written for the MINING AND SCIENTIFIC PRESS.

The Mother Lode does not appear in its greatest width in Amador county, but its deepest and greatest mines are developed in that county, and the large and profitable production of the mines of that county on this mineral belt has made it a mining field of unusual interest to students of mining geology and mining methods, as well as to investors. There have been few disappointments in investments in mines of the Mother Lode in Amador, where the surface showing has justified the investment, and there have been some fortunate strikes in the way of unlooked for ore bodies discovered by systematic development. There is considerable difference in the character of the veins along the Lode in this county, but, on the whole, there is less variation in geological condition, possibly, than is found in some of the other counties through which the Lode passes.

In the southern portion of Amador, from the Mokelumne river northward to the vicinity of Jackson, the Lode appears as a series of approximately parallel veins and lenses or zones. Some of these are found wholly in the black clay slates (Mariposa beds), others in the amphibolite schists (altered greenstone tuffs), and a third class is found in part at contact of the black clay slates and the amphibolite schists. This section has been the scene of several large and unfortunate investments, but in view of the great success of some of the mines on the same Lode 2 or 3 miles farther northward it may be contended that some of these enterprises were justified by surface indications. Had they proven successful ventures, the managers would have won fame and fortune, but as some of them were not, the managers should not be held wholly responsible. There is a well-known adage that "good mines make good miners," and this will apply with force to some of the less fortunate miners of the southern end of Amador county.

In the southern limits of the town of Jackson is the Zeila mine, one of the most noted in the county. This mine has probably had the longest period of continued activity of any mine in Amador. It occurs almost wholly in the amphibolite schists, as a series of fahlbands, with numerous veins of gold-bearing quartz, between which the schist, more or less silicified, contains gold and auriferous pyrite. The Zeila apparently is isolated from the other mines of the belt, as nothing of value has as yet been developed either north or south of it in the immediate vicinity.

To the westward several hundred feet is a fissure in black slate, which is traceable in a generally northerly direction several thousand feet, but as this vein has not been followed continuously by mine workings, it is a question whether it is a single fissure or a series of fissures of uniform strike and similar characteristics. In Amador county, as elsewhere, miners are inclined to lay down arbitrary lines in indicating the course of an undeveloped vein, when, in fact, in a developed mine the vein is rarely perfectly straight for long distances, but swings from side to side in a more or less sinuous course, and its dip usually varies in like manner, changing from one angle to another. In view of these known facts it seems necessary to allow some latitude in assuming the strike of a vein which cannot be traced with absolute certainty on the surface. On this almost wholly undeveloped vein are found the Good Hope claim, in the southern part of the town of Jackson, and the Muldoon claim, about 4000 feet to the northward. Intermediate of these mines, there are several wells and prospect holes within the town of Jackson, all in a general line, which are probably on this same fissure, and all of them contain gold-bearing quartz of a character similar to that found in the great mines a little farther northward. The Argonaut and Kennedy mines are about a mile north of Jackson, on the foot wall vein of the Lode. This is one of the most interesting sections of the great Lode, because of the great extent and value of the mines developed on it at this place. The outcrop of the foot wall vein is found on the summit of the hill, near the Kennedy chlorination works, and is also exposed in a shaft sunk 60 feet through the andesitic cobbles and sand of an ancient river channel, back of the Argonaut hoist. Southward this ancient channel has been eroded, and the outcrop again appears on the surface, and may be traced almost without break to the Alma mine, on the hill west of Jackson. This outcrop occurs throughout the entire distance here mentioned, in the massive greenstone, which here along the surface is much decomposed. The vein itself varies in thickness from a few inches to over 12 feet, consisting of solid quartz, and the dip along the surface ranges from horizontal to about 35° to 40° to the eastward. In depth it becomes steeper and at about 800 feet is found to have an angle approximating 63°. At greater depth it becomes even steeper than this, but in still greater depth (2000 feet) shows a flattening tendency with a greatly increased size. The development of the Argonaut and Kennedy mines shows the outcrop vein to occur in the plane of a thrust fault, in which the hanging wall has been moved upward relatively

to the foot wall. In a raise in the Argonaut, a short distance south of the shaft, this is shown to be about 125 feet. It may be that there is also a longitudinal movement, though as to this the writer is unable to state. In the Kennedy mine, and also in the Argonaut, this foot wall vein has been worked more or less extensively from the surface downward, but no considerable body of pay ore has been found in this fissure along the surface outcrop, southward from the vicinity of the Argonaut shaft. A large amount of development was done on the Alma—shaft sinking, drifting and crosscutting to the extent of several thousand feet—but little ore of value was found. There still remain several hundred feet of this claim which have not as yet been proven.

The Argonaut-Kennedy fissure is often referred to as a contact vein. This is true in part only. The surface outcrop, as previously stated, is wholly in greenstone, which fact is prima facie evidence that it is not a contact. In depth the vein is found in part at contact of black slate and greenstone schist, and again wholly in the black slate, while in great depth there are large ore bodies in the amphibolite schist. In the deeper portions of these mines the vein assumes more the characteristics of a great zone of mineralization, in which are several veins or lenses, rather than the simple type of vein occurring in that portion nearer the surface. It is very probable that the Good Hope-Muldoon fissure forms a junction with the Argonaut-Kennedy vein at some place, but as far as known the point of union has not as yet been discovered. It may be farther south than the development has yet extended. It also seems probable in the present state of knowledge of this portion of the Lode that the former fissure will be found to be the principal ore carrier for some distance to the southward.

The Oneida mine adjoins the Kennedy on the northward, and as the workings practically have been connected there remains no doubt of the identity and continuity of this vein in these two properties. The topography of the ground in this part of the county has been largely determined by the course of the ancient river channels, the volcanic cap of which has to a great extent protected the softer slates and schists adjacent to the Lode from erosion. Were it not for this there is little doubt that the course of the Lode would be marked by a valley or cañon, as is the case in several sections northward where this protection has not been afforded. The vein continues with many of the characteristics common to the Kennedy, through the Oneida into the South Eureka, where the ground is much broken, there being several veins, with the usual characteristics—heavy black gouges, banded quartz and swelling ground—which are features of nearly all the important mines on the Mother Lode in Amador county.

Adjoining the South Eureka on the north is the Central Eureka. Here the vein has narrowed, so far as known, to a single great fissure, with an occasional branch into the hanging wall. This fissure in the vicinity of the shaft produced no ore of consequence until a depth of about 1000 feet from the surface had been reached. Below this level ore formed in a series of shoots, which growing longer and wider with depth eventually formed a large and valuable ore body. Near the north end of this property a rich shoot of ore was discovered and worked in early days. It was at that time known as the Summit mine. The mine is now developed to a depth of over 2000 feet. North of the Central Eureka are the Badger and Eureka claims, known as the Consolidated Amador. It is now more than thirty years since this property was in operation. Prior to that time it is credited with having produced over \$18,000,000. The workings are over 2100 feet deep and have been flooded for years. The writer has never had an opportunity to inspect the underground workings, but it is said by those who should know that this is a simple fissure occurring at contact of a greenstone hanging and a black slate foot wall. A peculiar feature of this mine, which may or may not have a bearing on the occurrence of the rich ore bodies, is in the fact that in this property the Mariposa slates have narrowed down to from 150 to 200 feet, while just north of the bonanza shoot the slate area suddenly widens to 1000 feet or more. In this connection it is of interest to note that at the Kennedy-Argonaut the slate strip is also comparatively narrow, and a similar condition is observable at the Keystone mine at Amador City. These may be merely incidental, but the geological fact is well established. At the Eureka mine little or no greenstone or amphibolite schist is found on the dumps, indicating that the workings were almost wholly, if not entirely, in the slate. In size the vein is described as varying from 3 or 4 feet to upwards of 100 feet in width. The ore was often phenomenally rich in gold, for so large a vein, producing much fine specimen rock. Early reports credit the mine with ore worth \$27 per ton which netted \$22. The vein, so far as known, continues northward into the Wolverine mine, which, however, has no record as a producer, though it is supposed that the vein in the Wolverine is identical with that found in the south end of the Wildman which adjoins it on the north, and that the continuity through the Wolverine is unbroken between the Wildman and the Eureka.

Many of those unfamiliar with the Mother Lode have formed the impression that the Lode is a single

great vein, occupying the plane of a contact fissure. How erroneous this idea is, is best known to the miners of the Lode. It is true that from the Central Eureka to the south end of the Wildman mine, a distance of about a mile, the vein apparently approaches this ideal, but to the northward and southward the Lode has many branches, and usually it consists of a number of veins having an approximate parallelism, the veins varying in character with the enclosing rock. In slaty rocks the vein generally has a banded or ribbon structure. In massive and schistose rock the vein is more or less massive, and on the contacts it is found banded adjacent the slate wall and more massive on the greenstone side.

In the Wildman mine a variety of veins occur. Here are found beautifully banded veins, solid massive veins, brecciated veins and granulated masses, the latter two classes indicating, together with the striations and grooves with polished surfaces, the intense pressure and movement to which these rocks have been subjected since the period of ore deposition.

(TO BE CONTINUED.)

## Rock Drilling.

Written for the MINING AND SCIENTIFIC PRESS by W. W. WORD.

A well written article appeared recently in these columns relative to power-made and sharpened rock drills. The deductions arrived at seemed clear and the points well taken, but much has been said on this subject by writers who see it from different points of view and each uses arguments which would seem to make his position impregnable.

The sizes and shapes of the bits for machine drills are as various and peculiar as the minds of men can devise. One of the new-fangled bits in use for a year or more at some of the copper mines in Michigan consists of the regulation cross bit forged so that a chisel part, about one-third the width of the drill, projects from  $\frac{1}{4}$  inch to 1 inch ahead of the cutting edges of the drill proper. This chisel part is forged in the center of the bit and parallel with two wings. The advantages claimed for it are that the chisel part, cutting ahead of the main part of the bit, prevents the bit from leading off or fitchering in seamy rock. Another peculiar bit which has many advantages claimed for it, and which is used to some extent in the Northern iron mines, is a single bit with two ribs or wings running along the sides and terminating about  $1\frac{1}{2}$  inch from the cutting edges. These wings or ribs do not carry cutting edges, but are intended to hold the drill in the center of the hole, and at the same time to give strength to the cutting part. It is said this drill will not rifle a hole or become fitchered. These kinds of drills are, however, expensive to make and resharpen unless a power drill sharpener is used, as the chisel part mentioned naturally wears faster than the rest of the bit. To renew this chisel part the wings have to be upset until sufficient stock projects ahead to form this important part, which operation is very expensive and laborious if undertaken by hand.

As to the gauges of drills, experience has shown that in hard rock the best results cannot always be obtained by having a uniform step or drop in the gauges; that is to say, the difference in sizes should be greater in the first three drills than in the last four or five, for the reason that the starters and first drills used have a greater area of rock to cut, and will consequently wear down more in a given depth than the smaller drills that follow. What this difference in sizes should be varies as to the character of rock to be drilled.

Opinions differ as to the size a drilled hole should be at the bottom, but usually a miner tries to get all the powder he can at the bottom of the hole; his object, ostensibly, is to break the rock to the depth he has drilled. There are few things that cause more annoyance and provoke more profanity with the miner than finding, after a round of holes have been fired, that a number of "stubs" or "butts" remain to be fired over again to square up the face of the drift or stope. In hard ground he usually lays it to pointing his holes too strong, which is sometimes the cause, but it would seem by a simple line of reasoning that if the full charge of powder could be placed at the bottom, where its force would be exerted from one place, instead of stringing it out from one-half to two-thirds the depth of the hole, better results would follow, as it is more likely the powder would break the rock to the bottom of the holes so that another full round could be put in without having to put in "pops" or shoot old "stubs" over again to square up the work.

If some genius would invent a practical drill or device that would chamber a hole, permitting the full charge of powder to be placed at the bottom, it is likely he would materially reduce the powder bills of mining companies and greatly enhance the miner's chances of a future in the bright hereafter.

## Magnetic Concentration in Australia.

Much interest is being manifested in the approaching system of concentrating the crude ores of Broken Hill Junction North under magnetic conditions. Experiments have already proved that, with lead at £12 per ton, silver at 2s 2d per ounce, and spelter at £20



per ton, the refractory sulphide ore characteristic of the mine can by magnetic separation be turned into a profitable commodity, and any advance in these metals will correspondingly increase these profits, or vice versa if there is a fall. Up to the present time on the Barrier attention has only been given to treating tailings and secondary products for market purposes by the magnetic, so that the concentration of

### Two Black Hills Mines.

Written for the MINING AND SCIENTIFIC PRESS.

Among the many successful mining enterprises in the Black Hills of South Dakota, the Wasp No. 2 has attracted attention. It was located more than ten years ago and is situated on Yellow creek, which

careful methods of mining and sensible arrangement of mill the costs were reduced to a figure where a good profit was possible from ore containing but \$4 to \$5 per ton. It is stated that at one period ore containing but \$1.60 per ton paid a small profit. One of the accompanying illustrations is that of the Wasp No. 2 mill, on Yellow creek. It is a dry-crushing mill, situated in a position where advantage may be taken of gravity in handling material. The ore is delivered to the leaching vats by belt conveyor running at a speed of 600 feet per minute, the time of filling being from two to two and one-half hours, and is found to be a less expensive way of filling than by cars running over the tanks, as was formerly the practice at this mill.

When the tanks are about half filled a strong solution (6 pounds KCy per ton) is turned on. Fifteen tons of this solution are run in and the charge allowed to stand three or four hours, occasionally longer, depending on the character of the ore. When the strong solution is started draining off, weak solution is run on to replace it, contact being continued an hour longer. Leaching then begins and the weak solution is continued to replace that running off until wash water is added. When the values in the solution are not greater than about 35 cents per ton the wash water is applied. Precipitation and cleanup are effected in the usual manner.

The ore bodies of the Wasp No. 2 and those of the immediate vicinity are all in the Cambrian, lying upon or in the quartzite. In the Wasp No. 2 is a large intrusion of porphyry, which is split into two branches going southward. There is a small displacement (8 to 20 feet) along these dikes, and the ore occurs in close proximity to the intrusion. Between the two branches of the dike was found an ore body 40 by 60 feet in superficial area, and 5 or 6 feet thick, which is said to have produced \$75,000. In this mine and several others near by was mined a quantity of wolframite (tungstate of iron and manganese) and a large amount of it was shipped to the smelter for the gold contained before the presence of the tungsten mineral was recognized. The ore is usually covered by a few feet of soft shale and soil, which is stripped off and the ore mined by open cut system. The drilling is done by means of a churn drill, the holes being 10 to 20 feet

deep, depending on the thickness of the ore body. These holes are "chambered"—that is, enlarged by shooting first several small charges of dynamite in the bottom of the hole, and later larger charges, and finally a heavy charge of black and nitro powder, which usually breaks a large amount of ground. One blast of this character is described as follows: The hole was drilled 19 feet deep and sprung with 5 sticks of dynamite. The second shot took 15 sticks, the third 75 sticks and the fourth 200 sticks (about two 50-pound boxes), the fifth 3 kegs of black powder, and the sixth with 3½ kegs of black powder. It was then thought the rock had been sufficiently shattered to blast. The hole was charged with 40 kegs of black powder and the blast fired, which, it is said, broke 3000 tons of ore, at a cost for labor and powder of \$550, or about 18 cents per ton of ore broken. The breaking of ore in this manner reduces mining expense to a low figure, and where conditions are such that the broken ore can be drawn off through a mill hole to a chute below the cost is still further reduced.

The Hidden Fortune Co., whose mill is also illustrated, owns a group of mines within ½ mile of the Homestake, and adjoining some of the mines of that property. In the early days these mines were opened in the Archaean schists, in which were found rich veins and zones of gold ore similar to those of the Homestake, but of comparatively small dimensions. In the Cheyenne mine, one of the group, rich specimen ore was found as early as 1878. The Bingham mine, another of the group, was sold for a large sum in the early days, but the property did not attract

marked attention until the discovery of very rich ore in the Cambrian on the Hidden Fortune by O. P. Grautz in 1899. The prospector was searching for wolframite, but found thousands of dollars in coarse gold.

A company was organized to operate the property and a mill built 3 miles below Deadwood and about 6 miles from the mine. For some reason the property has not been operated steadily, but it is now in the hands of new managers, and probably will be worked steadily. The ore from this property consists of two kinds, the free milling schistose ore of the Archaean and the quartzite ore from the Cambrian. Whether these two classes of ore can be suc-



Mill of the Wasp No. 2 Co., Near Kirk, South Dakota.



Hidden Fortune Mill, Near Deadwood, South Dakota.

raw ore by this method on the Junction North will prove a valuable object lesson. The crude sulphides in the mine as a whole are highly charged with rhodinite (manganese spar), and likewise with garnet sandstone, which makes them highly sensitive to electrical influences, and the metals become readily separated with high recoveries. The arrangements are complete, with the exception of the magnetic separators, eight in number, which are being constructed in South Australia. Experiments are being carried out at the Lithgow steel furnaces with silica sand recently discovered in the State, which, if successful, may obviate the necessity of importing silica.

joins the Whitewood creek near the town of Kirk. In its early history this mine produced more than \$500,000 from high-grade ore, which was shipped to the smelters. When the high-grade ore was exhausted the mine was closed down, for the low-grade ore would not pay the expense of mining, transportation and treatment. At that time the cyanide process had not yet been introduced in the Hills, but when this method of treating the oxidized ores of the Cambrian beds was worked out the Wasp No. 2 was one of the mines that was among the pioneers in introducing the cyanide process. The shipping ore had been rich, often exceeding \$100 per ton. The low-grade ore was worth but \$5 per ton, but by



cessfully treated by a single treatment is a question. At the Hidden Fortune mill both amalgamation and cyaniding are practiced. The capacity of the mill of sixty stamps is over 300 tons daily. The ore is crushed in the cyanide solution, in which respect it differs from other cyanide plants in the Hills.

### Gold Dredging in Oroville District, Cal.

Following is an abstract of the annual report of the Oroville Dredging & Exploration Co. of California for the year ending December 31, 1904, made by F. W. Bradley, president, to the stockholders of the company:

Our No. 1, or \$45,000 dredge, made the following record:

Cubic yards dredged.....	493,150
Gold yield per cubic yard.....	12.33 cents
Operating costs.....	5.62 "
Operating profit.....	6.70 cents or \$32,905.79
Improvement, taxes, insurance, legal and all other working expenses (except construction of No. 2 dredge).....	7,166.88
Surplus.....	\$25,738.91

Our No. 2 or \$75,000 dredge should be ready to begin work next month (January, 1905). Figuring on the data now available, the two dredges should make following average annual record:

	Cubic Yards Dredged.	Operating Cost Per Cubic Yard.	Probable Yield Per Cubic Yard.	Surplus.
Dredge No. 1 (first cost, \$45,000).....	530,000	5.30 cents.		
Dredge No. 2 (first cost, \$75,000).....	780,000	5.00 cents.		
Totals and averages 1,300,000.....		5.12 cents.		
Improvements, taxes and all other working expenses.....		0.88 cents.		
Total.....		6.00 cents.	9.5 cents.	3.5 cents.

Or a yearly surplus of \$45,500. Our prospect information indicates that after rejecting that portion of our land of doubtful value, the property should have a life of from thirteen to fourteen years at the above estimated rate of dredging.

C. H. Munro, superintendent, makes a detailed report of the company's operations, from which the following is taken:

**EXTRACTION.**—The prospect value of the area dredged, based on the average value of the holes in and near the dredged area, was 16.64 cents. The extraction table herewith attached, which is computed on these figures, makes the extraction 74% of the prospect value. The extraction amounted to 76.37% of the prospect value, based on the proportional or fractional areas as influenced by each prospect hole.

It would, therefore, be fair to call the extraction 75.18% of the prospect value, which is the average of the two methods of computation above referred to.

During the year just ended, Biggs No. 1 dredged 11.85 acres, handling 493,150 cubic yards, which yielded a gross bullion return of \$60,738.52, or an average yield of 12.32 cents per cubic yard, as compared with a gross bullion return of \$36,525.25, or an average yield of 8.45 cents per cubic yard for 1903.

**COSTS.**—The operating cost has been 5.62 cents per cubic yard, and the total cost, including all improvements, repairs, taxes, insurance, legal, office and other expenses (excepting Biggs No. 2 construction account), has amounted to 7.06 cents per cubic yard.

Comparing the capacity of the dredge and the cost of operation for 1904 with 1903, the capacity has increased from 39,551 cubic yards per month to 41,096 cubic yards per month, while the cost of operation has decreased from 6.48 cents per cubic yard to 5.62 cents per cubic yard, and the total expense from 7.71 cents to 7.06 cents per cubic yard.

The bullion yield has increased from 8.45 cents per cubic yard to 12.32 cents per cubic yard.

**REPAIRS.**—Aside from the ordinary repairs on the dredge, a new revolving screen was installed at a cost of \$1600, and the 1 H. P. motor used for priming the water pumps and cleaning up was replaced by a 3 H. P. motor at a cost of \$127.55.

**FUME REPAIRS.**—During the floods last February 500 feet of the flume and trestle were washed away. The rebuilding of the flume and trestle and repairs at the pump station cost \$357.40.

**IMPROVEMENTS.**—The blacksmith shop equipment has been enlarged at a cost of \$547.45 by installing a 5 H. P. motor, with transformer, a forge, blower, emery wheels, grindstone and small drill press.

**BIGGS NO. 2 CONSTRUCTION.**—The hull of Biggs No. 2 is completed and the dredge was floated the first of the year. The contractors are now installing the machinery and the dredge will probably be ready for operation about the middle of February, 1905.

BULLION TABLE.

MONTH.	Cubic Yards Dredged.	Bullion Yield.....	Operating Expenses.....	Yield per Cubic Yard.	Operating Profit per Cubic Yard.
January.....	20,340	\$3,120.87	\$2,677.00	15.38c	2.22c
February.....	32,000	3,408.69	2,205.07	10.65c	3.76c
March.....	41,160	7,732.62	2,418.94	18.78c	12.90c
April.....	50,760	9,630.10	1,854.69	19.01c	15.26c
May.....	47,700	8,072.17	2,233.41	16.94c	12.20c
June.....	40,750	3,704.36	2,018.97	9.09c	4.15c
July.....	44,380	4,271.03	2,272.36	9.62c	4.50c
August.....	39,800	4,273.31	2,471.91	10.87c	4.58c
September.....	41,600	4,265.74	2,392.09	10.25c	4.50c
October.....	48,460	4,645.08	2,620.83	9.58c	4.18c
November.....	40,300	3,374.92	2,340.96	8.37c	2.56c
December.....	46,400	4,369.73	2,331.31	9.30c	4.18c
Totals and Averages.....	493,150	\$60,738.52	\$27,832.53	12.32c	6.70c

EXTRACTION TABLE.

MONTH.	Depth in Feet.....	Dredged. Acres.....	Cubic Yards—Bank Mensurement.....	Number of Prospect Holes in and Near Dredged Area.....	Prospect Value of Ground Dredged.....	Recovered.....	Prospect Value.....	Total Gold Recovered in Cents Per Cubic Yard.....	Operating Costs in Cents Per Cubic Yard.....	Character of Ground Dredged.
January.....	32.1	.40	20,340	2	15.35	100.20	15.33	13.16	13.16	Coars gravel to surface; dredging across slough.
February.....	22.0	.90	32,000	2	15.35	69.57	10.65	6.89	6.89	10 feet top soil; 2 feet of gravel on bedrock; hard digging.
March.....	28.7	.89	41,160	3	37.70	50.00	18.78	5.88	5.88	10 feet soil; gravel coarse and hard digging.
April.....	27.0	1.15	50,760	3	37.70	50.00	18.91	3.65	3.65	12 feet top soil; 15 feet coarse gravel; 3 feet on bedrock; hard digging.
May.....	27.0	1.09	47,700	3	16.25	104.24	16.94	4.68	4.68	12 feet top soil; gravel coarse.
June.....	31.4	1.18	40,750	3	10.35	87.96	9.09	4.94	4.94	10 feet soil; gravel firm and sand on north side of cut.
July.....	32.0	1.25	44,380	3	11.45	84.02	9.02	5.12	5.12	4 feet top soil; coarse gravel on west side cut; sand streak on east side.
August.....	26.0	.93	39,800	2	11.45	94.93	10.87	6.29	6.29	6 feet top soil; sand streak on west side of cut; all fine gravel; easy digging.
September.....	24.2	1.06	41,600	2	4.40	230.00	10.25	5.75	5.75	6 feet top soil; sand on west side of cut; all fine gravel; easy digging.
October.....	23.8	1.27	48,460	3	5.25	182.43	9.58	5.40	5.40	6 feet top soil; sand in center of cut; remainder fine gravel; easy digging.
November.....	31.0	.81	40,300	3	17.23	48.58	9.37	5.81	5.81	7 feet top soil; east side cut in sand; remainder of cut fine and coarse gravel.
December.....	28.8	.92	46,400	3	17.23	53.40	9.30	5.02	5.02	7 feet top soil; coarse and fine gravel full width of cut.
Totals and averages.....	25.8	11.85	493,150	29	16.64	74%	12.32	5.62		

The figures for the several items of expense in the following tables varied from month to month throughout the year, and the averages for the entire year only are given:

OPERATING AND ALL OTHER COSTS.

	Total for Year.	Total Expense in Cts. per Cu. Yd.
Operating expense Biggs No. 1 and superintendence.....	\$27,832.53	5.62 cents.
General expense, Oroville and San Francisco.....	1,738.62	.36 "
General plant.....	1,262.78	.26 "
Bullion expense.....	251.34	.05 "
Taxes.....	1,942.66	.39 "
Warehouse.....	401.18	.08 "
Insurance.....	450.00	.09 "
Legal.....	1,070.50	.21 "
Total and averages.....	\$34,999.41	7.06 cents.

DETAILS OF OPERATING COSTS.

	Total for Year.	Per Cent of Total.	Cost Per Cu. Yd.
Labor—			
Operative.....	\$6,435.20	22.9%	1,290 cents.
Repair.....	4,690.41	16.8	.943 "
Superintendence.....	1,875.00	6.8	.380 "
Power—			
Dredge.....	4,902.81	17.7	1,000 "
Pumps.....	68.20	.3	.014 "
Hardware—			
Supplies, Tools, Oils, etc.....	1,109.77	4.0	.220 "
Repair parts, etc.....	6,768.23	24.4	1,370 "
Freight, express and bailing.....	504.69	1.8	.100 "
Steel cables.....	336.03	1.2	.070 "
Lumber.....	28.06	.1	.006 "
Electric supplies and work.....	285.67	1.0	.060 "
Clearing ground.....	794.40	2.9	.160 "
Sundry expenses.....	34.06	.1	.007 "
Totals and averages.....	\$27,832.53	100.0%	5.620 cents.

REPAIR TABLE SHOWING COST OF LABOR AND MATERIAL ON DIFFERENT PARTS OF THE DREDGE.

	Total for Year.	Grand Total.
Ladder—		
Labor.....	\$ 492.63	
Material.....	596.43	\$1,089.06
Bucket Line—		
Labor.....	1,328.07	
Material.....	3,237.35	4,565.42
Stacker—		
Labor.....	894.66	
Material.....	1,125.04	2,019.70
Winches—		
Labor.....	138.73	
Material.....	84.05	222.78
Screen—		
Labor.....	772.42	
Material.....	1,498.57	2,270.99
Pumps—		
Labor.....	125.50	
Material.....	16.80	142.30
Power—		
Labor.....	311.80	
Material.....	541.50	853.39
Lines—		
Labor.....	333.43	
Material.....	361.48	694.91
Gold Tables and Cleanups—		
Labor.....	152.03	
Material.....	74.71	226.74
Contingent Repairs—		
Labor.....	800.56	
Material.....	1,307.59	2,108.15

TABLE OF LOST TIME.

	Percentage of Total Time.
Ladder.....	10.7%
Bucket line.....	20.5%
Stacker.....	10.7%
Winches.....	3.5%
Screen.....	9.9%
Pumps.....	2.6%
Power.....	7.9%
Lines.....	9%
Cleanup.....	3.5%
Other causes.....	21.7%
Total lost time.....	32.8%
Dredging time.....	67.2%
Average number of cubic yards dredged per day of running time.....	2,005
Actual average number of cubic yards dredged per day of twenty-four hours.....	1,347

SUMMARY OF COSTS IN CENTS PER CUBIC YARD.

Year.	Dredge Crew and Power.	Repair Labor.	Repair Supplies.	Superintendence.	Oroville and S. F. General Expense.	Thames and Insurance.	Bullion Expense.	Grand Total.
1904.....	.69	.94	1.61	.38	.36	.48	.03	6.51
For three \$45,000 dredges these items would have been as follows:								
	2.69	.66	1.61	.17	.12	.27	.05	5.57

### Recovery of Tin From Scrap.

The treatment of new tin scrap, known as "detinning," has become of considerable importance in the United States, says the Journal of the Franklin Institute, and at least ten companies were actively engaged in this special branch of the industry during the year 1903. The average yield from tin scrap is approximately 2% of metallic tin. In addition, a

large number of small concerns in the principal cities recover the tin from old tin cans and similar material by a smelting treatment in a furnace, the tin being obtained in the form of solder, which is either used as a basis for making new solder or is treated chemically to yield metallic tin or tin salts. The residue of scrap iron is generally utilized in the manufacture of sash weights and other casting of inferior quality of iron.

### Ore Washing in Cripple Creek, Colo.\*

[FROM A STAFF CORRESPONDENT.]

The ore bodies of Cripple Creek district, Colorado, are peculiar in that, generally speaking, a large amount of sorting is necessary after breaking the ore down in the stopes. In some of the mines the ore is roughly hand-sorted under ground, in others all the rock broken in the stopes goes to the surface where the sorting is done by various methods, partly by hand and partly by mechanical means. The values are usually associated with soft material, while the hard rock of the vein or zone of mineralization is almost destitute of value. This condition renders the cost per ton of mining unusually expensive. Little ore is hoisted to the surface in Cripple Creek under \$3 per ton, and most of it costs from \$10 to \$15 by the time it is ready for the mill or smelter, owing to the large amount of waste eliminated from the tonnage broken. The conditions obtaining here have resulted in the introduction of various devices for cleaning of the ore and the separation of the rich fines from the coarse waste.

It is a common practice among several of the mines in the Cripple Creek district to wash the ore before sorting. As a rule the deeper mines are wet, and in blasting much of the ore is broken into fine particles, which adheres to the rock. When it becomes dry and in handling the ore in this dry condition the fine particles of ore, which contain good values, are practically lost. Several styles of washers are in use. A number of the mines are operating the Crane washer, while some have installed washers of their own design, and others do not wash the ore, but sort it when dry, or as it comes from the mine. All the mines that have adopted some sort of washer are well satisfied of the necessity of this process and with the results obtained, and in several instances are increasing the capacity of the washer and improving on the methods now in use.

At the Portland mine the ore and waste rock are first run over sorting tables, and the ore is separated from the waste by men stationed at the tables. The waste passes through a chute into hoppers. The bottoms of these hoppers are lined with grizzly bars or perforated sheets of metal, and as the rock passes into these hoppers it is separated into thin layers. Above the rock is a coil of perforated pipes, from which a large number of jets of water fall onto the rock. The fine dirt passes down through the perforated plates or grizzlies into tanks and settles, and the water is again used for washing. The waste rock too large to go through the grizzlies or perforated plates is passed along by a rubber conveyor belt where men are watching for any ore that may have escaped the sorters.

The ore from the C. K. & N. mine is first run over a grizzly and screen underneath and the fines taken out, and the coarse rock sorted by hand without washing. The screenings are shipped without sorting.

The Old Gold Co. hoists its ore to the surface in buckets and dumps into cars and then trams to the ore house, where the ore is run over ¼-inch mesh screens. The screenings fall into a bin and are ready for shipment. The coarse stuff goes to another bin and from that is cobbled and hand picked, the waste being sent to the dump, the shipping ore going to the bin below. The bottom of the picking table is composed of a sheet iron plate with ½-inch round holes. Above the table is a pipe line, which carries the wash water along the picking table. At intervals there is a rubber hose attached to the pipe and as water is

\* See illustrations on front page.



desired it is turned on by the man in charge. All fine dirt adhering to the rock is washed through the bottom of the table into a tank below. This material is dried and shipped with the screenings.

The ore is taken from the bins at the Lonaconing through a chute, where there is a spray of water continually going over the ore. In the bottom of the chute is a 2-inch screen to permit of the fine dirt passing through to the tank below. The water passes through three tanks and after it becomes thick with slimes it is pumped up into the fourth tank and allowed to settle for four or five days, when it is pumped into the storage tank and used over again. In this plant there are four tables used for sorting. This washer is capable of handling 100 tons per day. The water is kept warm by live steam from the boiler.

As the ore is hoisted to the surface at the Elkton mine it is trammed to the ore house and dumped over a grizzly. Under this grizzly is a wire screen with 1-inch mesh. These screenings drop into a bin below and are taken from there to the loading bin. They do not pass through the washer. The coarse material passes to a large bin and from there it is drawn off through a chute, where it is washed by a spray of water as it falls onto a sorting table or shaking feed about 8 feet long. At this point several men are engaged in sorting the waste from the ore. The waste is thrown into cars and trammed to the outside of the building, and from there is taken up a 15° incline by a small friction clutch hoist to the dump. The ore as it leaves the sorters is delivered to a Blake crusher, where it is crushed and passes to an elevator and lifted 31 feet. This product is then discharged into a circular, perforated, revolving screen. This is the Crane washer. This revolving screen is 40 inches in diameter by 12 feet long. Where the ore is received into the screen the perforations are 1/2 inch; in the center of the screen they are 1 1/2 inch and at the discharge end 1 1/2 inch. The screen drum is carried on rollers and makes about eight to twelve revolutions per minute. The fine ore is screened out, dropping automatically into the bin underneath. The coarse ore is delivered into the second drum for washing. The second drum contains a steel spiral screw on the inside. This screw revolves at the rate of speed corresponding to the screen drum, and rests in a tank, so that about one third of it is submerged in order to wash the fine dust from the coarse rock, the water carried up by the screw being drained back into the tank by the rows of 3/4-inch holes near the delivery end. The drums are driven by a sprocket chain. The tank underneath the drum serves to hold the washing water and collect the slimes. A manhole at the bottom of the tank permits the removal of the slimes as often as necessary. The slimes when drawn off from the tank are placed in another tank or vat, where they are dried and then sacked for shipping. The ore passes from the washer onto a picking belt, which is run on an incline of several degrees in order to give space below for the ore to be thrown into bins instead of into cars. At each side of this belt there are several men sorting the ore from the waste. The waste is still retained by the conveying belt and discharged into a hopper, where it is drawn off into cars and trammed to the dump. The management is convinced that the belt should be arranged so as to deliver the ore and allow the waste to be picked out, as there is very little waste remaining on the belt after washing and picking below. The ore which has been thrown into the bins below is drawn off onto a conveying belt and run through a large crusher and crushed to about 1 inch. After passing through the crusher it is elevated 60 feet to the top of the building, where automatic samplers are used for sampling the product. The ore that is not taken out by the sampler is then passed down through a chute to the loading bins. This company operates its own sampler in connection with the washer and is able to tell within a few dollars how much they have made or lost the day previous. The screenings which do not pass through the washer are sampled the same as the ore. The screenings are not put through the crusher, but are carried by an elevator to the sampling room at the top of the building.

The Vindicator ore is sorted dry and the waste washed. The waste runs over a grizzly and perforated plate, then over a screen where there is a heavy spray of water, then onto a belt, where it is taken to another building and again washed and sorted by hand. This belt is 202 feet in length. The waste goes to a bin below, where it is loaded into railroad cars and hauled away. The Vindicator Co. is cramped for ground. The slimes from the waste are caught in settling tanks underneath the grizzly and perforated plates and allowed to settle and dry.

The El Paso mine brings all the ore and waste to the surface as it is broken in the mine. The ore is hoisted in cars holding 22 1/2 cubic feet of broken ore. The gallows frame is 84 feet in height, and from the collar of the shaft to where the ore is taken from the cage is 52 feet. The trammers take these loaded cars to the ore house where it is first run over a grizzly. Underneath this grizzly is a screen having 1/2 inch openings through which the finer material passes into a separate bin. The screenings are sampled, and if found to contain values enough to pay to ship are taken to the shipping bin, otherwise they go to

the dump. The screenings are not washed, but are shipped dry. The coarse rock, which has failed to pass through the screen underneath the grizzly, is drawn from the bin through a chute over a perforated metal sheet. These sheets are under all of the ore bins and are a part of the washer. The openings in the steel plates are 1/2 inch. Across this chute, and above the ore, is a horizontal pipe containing water under thirty-five pounds pressure. As the ore comes down the incline the spray of water is turned on and the dust and fines are washed off into tanks below where it is allowed to settle; the water after being settled is pumped back into the storage tank and used over again. At the lower end of the incline chute is a bench or sorting table, the top of which is made of sheet steel. On each side of this table is a man sorting the waste from the ore. If there is more waste than ore then the ore is picked out and the waste thrown into cars and trammed to the dump. If more ore than waste the ore is sorted out. In any case the ore is trammed to the shipping bin and the waste to the dump. This company does not have any picking or conveying belts. Everything is sorted on tables and trammed out in cars. Should the sorters find a large piece of ore containing ore and waste it is thrown on to the cobbing table where it is broken up and sorted. The water used in spraying the ore is warmed, during cold weather, by the exhaust steam from the hoisting engine. The water which is used in spraying and which passes through the steel plate to the tanks below is settled in three different tanks, the first one being a long tank where about nine-tenths of the washings are caught. It is then drawn into another tank and partially settled and from there to a third tank. The fines and slimes are thoroughly dried by steam. About four tons of slimes are caught through the washer each day, and about seventy tons of sorted ore are handled. The tailings will average very near to what the shipping ore runs. They have ten sorting tables and are increasing the capacity by five more.

One of the engravings herewith illustrates the Crane washer on the Abe Lincoln mine in Poverty gulch. The method of handling the ore at this property is practically the same as at the Elkton, with the exception of the sampling of the ore. There is also illustrated the picking belt and discharge end of the washer on the Last Dollar mine. These all handle the ore in about the same manner with the exception of a very few slight details.

## THE PROSPECTOR.

The rocks from Forbestown, Cal., are determined as follows: No. 1. Grano-diorite of normal type in which are seen quartz, feldspar—both orthoclase and plagioclase, black mica and dark green hornblende. The rock is very little altered. It may be the country rock for many veins, and should not be looked upon as unfavorable for mineral veins, for some of the best mines in the United States are found in rock of this description. No. 2 is also a granitic rock, apparently from the description and from its appearance a dike rock. It is essentially granulate. No. 3 is quartz with a little iron sulphide, and a bluish mineral in a thin film, which may be either molybdenite or graphite, probably the former; the quantity is too small to determine. This rock looks like a gold-bearing ore, and should be carefully tested, both by panning and by assay.

The rock specimen from Elmore county, Idaho, is a granitic dike rock, in which nothing remains in normal condition except the quartz, the feldspar (orthoclase) having been altered to halloysite, or a mineral closely resembling it. A small amount of white secondary mica is also present, either a remnant of the original muscovite, or a secondary mica derived from the alteration of the feldspar. This is a phase of the alteration of granitic rocks, particularly when occurring as intrusive masses, which is not uncommon. Although the rock does not show distinct schistose structure, it has been subjected to severe interior strains due to great compression and more or less movement. This is evidenced by the striations which may be seen on the softer portions of the rock and also in part by its complete alteration. Feldspar does not always alter into kaolin, but into various other substances as well, as in the present case.

The three samples from Placerville, Cal., are: No. 1. (black rock) bornstone, a variety of flint largely silica; No. 2 (gray) and No. 3 (gray) are similar—fine granular flint. All of these rocks are probably of concretionary origin, and may have been formed in limestone. Many such rocks are found in the ancient river gravels in the vicinity of Placerville, Cal.

The dark brown rock from Phoenix, Ariz., marked W. E. T., is apparently a much altered rhyolite in which what was probably either augite or hornblende has been altered to serpentine. There is also a development of calcite, due to alteration. There are numerous amygdulæ present, indicating that the rock was originally vesicular.

## Accidents in Mines.

TO THE EDITOR:—The remarks contained in the issue of the MINING AND SCIENTIFIC PRESS of Feb. 14, referring to the bill recently introduced in the State Senate of Illinois, providing that operators of mines shall provide men whose duty it shall be to load and blast holes, are of considerable interest and importance. Should this bill become a law, it will no doubt be welcomed by both mine owner and miner.

The necessity of adopting such measures in metal mining—not alone referring to the use of explosives, but covering all branches of mining work—is impressively emphasized by perusal of the statistical references to accidents sustained, over any period, in the coal mining industry:

The writer is not aware that any such complete records are kept in this country with reference to accidents in metal mining, and although the conditions of operation in coal mining, as well as, possibly, the standard of unskilled labor, would not admit of applying these figures to metal mining, they carry a good deal of significance and certainly reflect the importance of providing equally stringent laws in order that the casualties in an industry of as much importance as metal mining may be lessened.

The careless or ignorant use of explosives is but one of the dangers accompanying the work of mining as usually carried out in this country. The writer only recently called attention to the indifferent use of mine signals, while it is apparent to any engineer that a periodic examination of underground methods, including timbering, ventilation, lighting, condition and number of outlets, water or gaseous accumulations, etc., as well as bauling apparatus and boilers, would greatly decrease the number of accidents.

From an economical point of view, it appears doubtful if it is always advantageous to employ special men to load and blast all holes in underground work, as it does not seem likely that such a man, even though he possessed a good general knowledge of the mine, would be able to blast to the best advantage—that is to say, in the order of blasts and the quantity of powder used—unless, of course, he personally directed the work of drilling.

One method of lessening the accidents due to the careless and ignorant use of explosives is in the issue of "blasting certificates" to all miners who, after examination, have shown that they have a good general knowledge of the use and dangers of powder. In cases where accidents occur, and carelessness is shown, this certificate is cancelled.

One would think that a man who had spent say ten years at mining would be quite competent to undertake blasting operations without peril to himself, or others who might be within the danger zone, but experience in the examination of men in countries where blasting certificates are required show that a great many men who apply for work as miners have little or no knowledge of the use of powder, and are often ignorant of many other important considerations.

According to the report of the Bureau of Mines of Pennsylvania on the anthracite coal mines, the total number of deaths and injuries inflicted upon persons employed in and about the mines, with the average per 1000 employees, for 1903 was as follows:

	DEATHS.		INJURIES.		TOTAL.	
	Num.	Per 1,000.	Num.	Per 1,000.	Num.	Per 1,000.
Inside the mines.....	426	4.17	1,127	11.04	1,553	15.21
Outside and on surface. 92	1.85		198	3.98	290	5.83
Totals .....	518	3.41	1,325	8.73	1,843	12.14

An analysis of the accidents above recorded shows the following distribution, underground and on the surface:

	Fatal.		Non-fatal.		Total.
	Fatal.	Non-fatal.	Fatal.	Non-fatal.	
Inside the Mines.....	426	368	181	207	578
Falls of coal, slate, etc.....	210	70	249	319	
Mine cars.....	70	70	249	319	
Explosions of gas, etc.....	26	181	181	207	
Explosions of powder, etc.....	17	55	72	150	
Premature blasts.....	38	112	13	44	
Falling into shafts, etc.....	31	13	2	23	
Crushed at batteries.....	2	2	1	7	
Kicked by mules.....	6	17	6	17	
Suffocation by gas, etc.....	6	1	2	4	
Miscellaneous.....	22	129	22	151	
Totals .....	426	1,127	181	1,553	
Outside of Mines.....	92	60	25	59	105
Cars.....	39	34	4	5	
Machinery.....	25	34	4	5	
Suffocation in chutes, etc.....	4	2	2	4	
Boiler explosions.....	2	2	2	4	
Miscellaneous.....	22	96	22	118	
Totals .....	92	198	25	290	
Grand totals.....	518	1,325	206	1,843	

The percentage of the more important causes of accident to the totals were as follows:

	Fatal.		Non-fatal.		Total.
	Fatal.	Non-fatal.	Fatal.	Non-fatal.	
Inside of Mines.....	426	368	181	207	578
Falls of roof, etc.....	49.3	33.7	22.1	20.3	
Mine cars.....	16.4	16.1	13.3	13.3	
Gas explosions.....	6.1	12.9	14.2	14.2	
Premature blasts.....	12.9	13.8	15.0	15.0	
Other causes.....	15.3	14.3	15.0	15.0	
Outside of Mines.....	42.9	33.3	27.2	20.3	36.1
Cars.....	27.2	17.2	49.5	43.6	
Machinery.....	30.4	17.2	49.5	43.6	
Other causes.....	30.4	17.2	49.5	43.6	

The distribution of the employees is, as the report



points out, of more than ordinary importance. The number and classification is as follows:

Position.	Number.	Per Cent.
Mine foremen.....	360	0.4
Assistant foremen.....	276	0.3
Fire bosses and assistants.....	841	0.8
Miners.....	36,823	36.1
Miners' laborers.....	27,533	27.0
Drivers and runners.....	11,251	11.0
Door boys and helpers.....	3,087	3.0
Pump men.....	850	0.9
Company men.....	9,050	8.8
All others.....	11,824	11.7
Total.....	102,055	

These figures show that 67.2% of the labor was employed underground.

James F. Roderick, chief of the Mining Bureau, comments on the figures as follows: "The occupations of the 426 persons killed inside were as follows: Miners and miners' laborers, 312, or 73.24%; drivers or door boys, 58, or 13.61%; all other occupations, 56, or 13.15%."

Of the 102,055 employees underground, 64,356, or about 63%, were miners or miners' laborers, among which class over 73% of the fatal accidents occurred. For every 1000 miners employed 5.49 lost their lives, and for every 1000 miners' laborers employed 4 lost their lives.

These figures indicate clearly that the occupations of the miner and his helper is of an extra hazardous nature.

Of the 1553 accidents underground during 1903, 222, or 14.2%, were due to explosions of powder or dynamite, or premature blasts.

According to F. L. Hoffman, during the year 1903 there were 551,874 men employed and 1760 deaths in American coal mines, which amounted to a rate of 3.19 per 1000 employed. From 1894 to 1903 there were 4,439,732 men employed and 13,048 deaths, or a rate per 1000 of 2.94.

An international table prepared by Mr. Hoffman for the five years, 1898-1902, is very interesting. Including fifteen countries, there were employed 10,473,967 men. The total number of killed were 19,151, or a rate of 1.83 per 1000 employed.

Continuing his remarks, he says: "Assuming that the average annual rate of 1.83 per 1000 holds good for the remainder of the world (estimating the approximate number of persons employed in coal mining to be 2,500,000), we have it that, on the average, about 5000 persons annually are killed in the world's coal production." If we go further and apply the figure 14.2% as being the proportion of injuries due to the use of powder or other explosives, the annual casualties are shown to be no less than 710 persons.

If this be so of an industry which is under Government supervision and recognized organization, what would be the sacrifice rate per 1000 employed in metal mining?

Under proper supervision the dangers attached to mining should be largely theoretical and the work as free from hazard as many of our other industries.

Experience shows that, if left to the companies, reforms are limited by the sentiment of the individual manager, and often, in his desire to economize, not only are incompetent men employed on responsible work, but repairs to plant are delayed, which are a constant danger to the employees.

To the company or corporation, mining under limited Government supervision should be welcomed.

To the State it is a duty, and would exhibit a desire, that the industry should at least reach the same standard as that established in other countries.

To the miner, such qualifications as are exacted in countries where mining regulations are prescribed, are a certain guarantee of equality of knowledge.

The industry in California has surely reached a stage which warrants the adoption of regulations and the creation of power to enforce them.

F. C. ROBERTS.

Berkeley, Cal., Feb. 14.

The subject of the above communication is one of interest to every miner, and all will agree that it is desirable that the risk to which the miner is exposed should be reduced to a minimum, and in American metal mining districts most of the safeguards found about mines under Government inspection are afforded the miner. The high death rate and large number of non-fatal accidents, shown by the reports above referred to, were the result of the operation of coal mines. In metal mines the accidents do not generally reach so high a percentage, and are usually of a somewhat different character from those occurring in coal mines. The reports of those States having mine inspectors show a death rate considerably below that above quoted, and records kept in those States having no inspector do not show a higher rate. The State Inspector of Idaho, in a report just issued, gives a death rate of 1.3 for each 1000 men employed in that State. That in Colorado is somewhat higher. California has no inspector, but it is known that the death rate is low and the greater number of accidents of a character which no inspection nor Government supervision would have prevented. These are mostly due to premature blasts or drilling

into "cut-off" holes in shaft work. A bill has been introduced the present session in the State Legislature of California which provides for one inspector and an assistant whose duty it shall be to examine every operating mine in the State, inspect boilers hoists, cables, mine methods and a score of other more or less necessary things. It requires that the inspector be a mining, mechanical and civil engineer of not less than fifteen years experience in active mining. The salary is \$3000 per annum. A man competent to properly fulfill the requirements of the bill is worth five times the salary provided for in active mining work. If the bill were to become a law the mine inspector could not meet the demands of his office for the reason that it would be impossible for him to properly cover the ground. Legislation prescribing the methods of operating mines is always well intended, but it very often is impractical and falls short of supplying the relief sought. The miners themselves possess the remedy and they usually demand that the mine be operated in a safe manner. It is rarely, indeed, that accidents in mines are anticipated. Men are usually injured in some unexpected manner. A few days ago several men were killed by the falling of a cage at Butte, Montana, when an 8-inch flat steel rope broke which a few minutes previous had hoisted several tons of ore and cars. No mine inspector, had he been present, would have had the slightest suspicion of danger under the circumstances. It is useless to post a notice at the collar of the shaft, or at the station below, cautioning men not to walk into the shaft. Yet this is what they sometimes do. Most of the accidents in mines are the result of the carelessness of the miners themselves, as they will admit, and legislation against this kind of danger is useless.

### The Center Star Mine, Rossland, B. C.\*

Written by L. H. COLE.

The Center Star mine at Rossland, B. C., is located on the slopes of Red mountain northwest of the city. It is bounded on the west by the Le Roi, on the northwest by the War Eagle and Iron Mask, northeast by the Idaho and southeast by the Nickel Plate.

It is 1500 feet long by 600 feet wide, and was located in 1890.

The ore of this mine consists of iron and copper sulphides (pyrrhotite, chalcopyrite and pyrite, accompanied by arseno-pyrite). The principal value is in gold, which is chiefly in the chalcopyrite, but the copper makes an important addition, and there is always a small amount of silver present.

The veins vary in width from a few inches to 40 or 50 feet, and the pay shoots in some cases extend from wall to wall, while in others only parts of the veins are enriched. Sometimes the walls are very indistinct and the values run into the country and gradually decrease without any sharp line of division between ore and country.

The mine consists of several veins, either extensions from bordering claims or veins starting in the claim itself. The main Center Star vein, however, and the one in which most of the work is done, is the large shear zone fissure consisting of parallel platings of the rock produced by shearing under high compression. This vein runs along the southern slope of Red mountain and appears in the Le Roi mine; it has a dip varying from 60° to 70° and a strike that is approximately N. 68 E. It varies greatly in width and is cut by a large number of dykes and faults.

The Center Star and War Eagle mines are under the same management, and the offices are placed so as to be convenient to both.

The collar of the main shaft is located 500 feet from the west end line and 225 feet from the north side line of the claim. Over this shaft is erected the shaft house. The hoisting engines are on the hanging wall side, while the back part of the shaft is occupied by the ore bins.

Adjoining the shaft house and connected with it by two tram-car tracks is a 40x70 foot mill for framing of mine timbers, having the latest appliances for framing square sets and shaft timbers by power. This timber framing machinery was built by the Denver Engineering Works. A 48-inch swinging crosscut and rip saw complete the equipment, which give ample facilities for supplying the mine with framed timbers in the least time.

The War Eagle and Center Star hoists and Center Star compressor are all supplied with steam from the Center Star boilerhouse, which contains four horizontal tubular boilers (5x15 feet) of 100 H. P. each, carrying a steam pressure of 100 pounds, and three (88-inch by 16-feet) Scotch marine high pressure boilers carrying a steam pressure of 130 pounds and

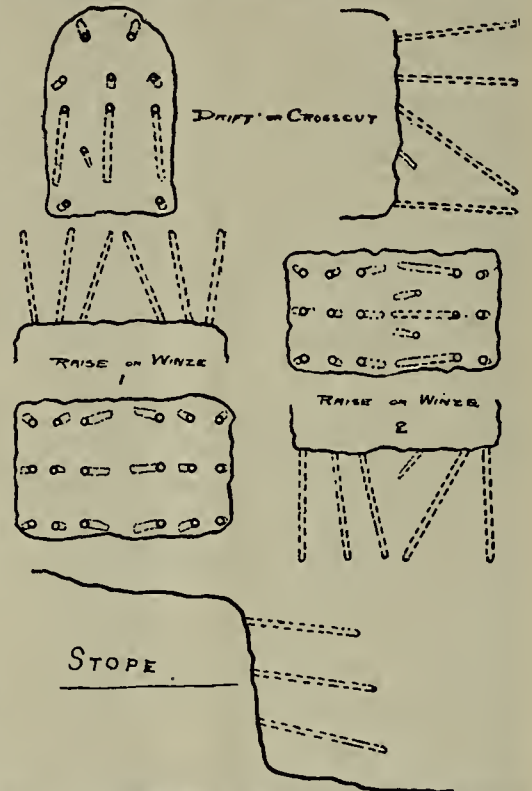
having a capacity of 175 H. P. each. The fuel used is Crow's Nest Pass coal.

**PROSPECTING.**—Prospecting and development were started in the usual manner on the Center Star claim. The veins were exposed by surface stripping in several places and prospecting shafts were sunk on the veins. Two tunnels were run in on the ore, and from these tunnels prospecting proceeded by means of crosscuts, drifts, winzes and raises; when it was considered that the mine was sufficiently proven the main shaft was sunk. Work on this shaft proceeded at three different points simultaneously, viz.: sinking from the surface, raising from the second level, and sinking from the second level; the mine is now worked entirely through this shaft. The collar of the shaft is 3688 feet above sea level. The shaft has a dip of 70°. There are three compartments, two of which are used for skips, while the third is used for a man-way and for the ventilation and compressed air pipes. Each compartment is 5 feet square, inside measurement. From this shaft eight levels are worked, varying from 125 feet to 175 feet apart on the slope.

At each level a large station is cut out and the ore loaded into the skips from large pockets under the level. From the station crosscuts and drifts have been run in different directions to locate and work the ore bodies.

**DRIFTING.**—Where possible, the drifts are driven along the foot wall, where, as the rock is extremely hard, no timbering is required.

The average advance per round of holes is 4.5 feet, working one machine two shifts per day. The total



Method of Placing Holes in Blasting at Center Star Mine.

advance for a month varies from 70 feet to 100 feet; the grade of the drift is  $\frac{1}{4}$  of 1%. Drifting is always kept well in advance of ore extraction.

The raises are put in at irregular distances along the drifts, and are usually of two compartments, one a man-way and the other an ore chute.

**DIAMOND DRILL WORK.**—Two sizes of drills are used, one of 1½-inch core diameter, and the other with 1¼-inch core diameter. The machines are seldom used for boring over 300 feet.

In starting the drill, especially for those drifts in which tramming is carried on, a short crosscut is first blasted out to give room for operating the machine without interfering with other work. The rods are square threaded and are in 5 feet lengths; they are pulled in 5 feet to 10 feet lengths, according to the space available behind the drill. The average length of the core pieces saved is from 5 inches to 8 inches, but often the length of the core barrel is kept intact.

The drill engines are screw fed, and fitted for 300, 700 and 1000 revolutions per inch of advance. Their ordinary speed is 300 revolutions per minute with a maximum of 1500 revolutions per minute. The water is pumped through the drill rods by a small independent force pump run by compressed air. In an eight-hour shift, the progress made is about 10 feet.

Since the rock in which the drilling is carried on is very hard, the bits require to be reset frequently, drilling about 12 feet before resetting is necessary.

If the drill hole is not deep, the rods are pulled by hand, but if 200 feet, or so, the work is too severe, and a drum is then used on which is coiled the wire rope.

The core, after it has been examined and sampled,

\*Abstract Trans. Canadian Soc. Civil Engrs.



is placed in trays and put on shelves in the core house for future reference.

**NARROW STOPE.**—A large part of the workings consist of narrow stopes less than 15 feet wide. Having carried up the raise a sufficient height, stoping begins at the lowest limits of the pay ore and the stope is driven to the boundary of the pay shoot. Round stulls are used and a close floor of lagging is spiked on the stulls; stoping above the floor then commences.

The broken ore is kept close up to the face so as to have a good footing for the machine men.

When the pay ore begins just above the drift, a raise is not kept in advance of the stoping, since the whole back is worked as a stope. In this case, there is a permanent tight floor left above the drift.

**WIDE STOPE.**—For stopes of a width greater than 15 feet square sets take the place of stulls. The length and breadth of the ore body is first determined and sill floor laid down. Breaking down the ore from the back is then started. Enough space is always excavated above the last floor to leave room for drilling the back. For a change of width in the ore body, the stope is extended by attacking the hanging or foot wall, or by leaving out as many sets as is necessary, according as the vein widens or narrows.

(TO BE CONTINUED.)

### Map of Lake City, Colo., Quadrangle.

The range of altitude in the Lake City, Colo., quadrangle amounts to over 6300 feet, extending from an elevation of about 8000 feet above sea level on the Gunnison river, in the northeastern portion of the quadrangle, to the summit of Uncompahgre Peak, the loftiest point in southwestern Colorado, a massive mountain that rises to a height of 14,306 feet.

A portion of this quadrangle is embraced in the San Juan mineral district, and most of the mines in this quadrangle are along or near Henson creek. Much gold and silver has already been taken from this area, and it is believed that there will now be renewed activity in this district.

Lake City, the principal town in the area, is in the southeast corner of the quadrangle, at the junction of Henson creek with the Lake Fork of Gunnison river. It is the terminus of a branch of the Denver & Rio Grande narrow gauge railroad. Well built wagon roads lead from it to the neighboring mining camps.

Along the valley north of Lake City are various ranches on which crops of hay and vegetables are raised with the help of irrigation.

The horizontal control for this map was furnished in part by the transcontinental triangulation of the United States Coast and Geodetic Survey, from which extensions were made to secure the necessary positions by J. F. McBeth of the United States Geological Survey, who also did the topographic work. The map may be obtained for 5 cents on application to the Director of the United States Geological Survey, Washington, D. C.

### The Sturtevant Sampling Outfit.

The two machines described herewith are the latest addition to the line of Sturtevant machinery. The laboratory fine crusher is built on the same lines as the large crushers of this type and has special adaptability to cleaning. The machine is built in two sizes, with jaw openings 2x4 inches and 2x6 inches. The one illustrated is the 2x6-inch size, which weighs about 600 pounds, has a capacity of from 250 to 600 pounds per hour, crushing to sand size without screens. The front head and stationary jaw may be easily removed when both crushing surfaces are exposed for cleaning after each sample. The jaws and shields are of manganese steel, the toggles of bronze, working in tool steel seats. It is built for fine work and designed to crush hard ore to  $\frac{1}{4}$  inch and finer without clogging. The 2x4 crusher may be run by hand or power if desired.

The special sample grinder is designed to take the product from these crushers, or reduce hard or soft ore crushed to  $\frac{1}{4}$  inch and finer to 200 mesh, without screens, and it is adjustable for coarser work by turning the hand wheel. From a view of these devices it would seem as if the bucking board would soon be a thing of the past, except for very small lots of ore. This sample grinder is conveniently accessi-

ble, its grinding discs swinging open like a door, for cleaning or replacing the discs or plates.

Full particulars may be obtained by addressing the Sturtevant Mill Co., Boston, Mass.

### Gold Mining in Rhodesia.

NUMBER III.

Written for the MINING AND SCIENTIFIC PRESS by F. C. ROBERTS.

A comprehensive idea of the capital required in the full equipment of a mine upon a 20-stamp basis may be gathered from the following figures, which pertain to a plant recently completed by the writer:

#### TOTAL COST OF ERECTING A 20-STAMP MILL AND NECESSARY EQUIPMENT.

	Total Cost.....	Cost per Stamp.	Percentage of Total Cost.....
20-stamp mill (1300 lbs.) with timbers, shafting, pulleys, etc.....	\$ 48,951 38	\$ 2,447 58	23.9
Two crushers, each having a capacity of 10 tons per hour.....	3,407 70	170 38	1.6
H. P. half of horizontal tandem, compound, Corliss engine.....	8,850 61	442 53	1.3
Two mill boilers, 75 H. P. (type, multi-tubular).....	12,853 91	642 69	6.2
Economizer.....	834 74	41 73	.5
Totals.....	\$ 74,898 34	\$ 3,744 91	
<b>SHAFT PLANT.</b>			
Head gear (pitch pine), height 40 ft., capacity in bins 80 tons.....	\$ 8,163 31	\$ 408 15	3.9
Holting engine 40 H. P., geared.....	4,212 19	210 60	1.9
Boiler 50 H. P. (multitubular type).....	6,079 04	303 95	2.0
Economizer.....	368 60	18 47	.16
<b>ELECTRIC PLANT.</b>			
60 K.W. generator, 20 H. P. motor, 10 H. P. motor, auxiliary engine, wiring, lights, poles, etc.....	14,375 79	718 29	6.9
<b>PUMPING STATION.</b>			
3-throw horizontal pump, capacity 12,000 English gallons per hour.....	1,912 76	95 63	.93
<b>WORKSHOPS.</b>			
Lathe, screwing machine, saw bench, threading machine, meal mill.....	5,036 82	251 84	2.4
Assay plant.....	1,971 52	98 57	.98
Water Service: Pipe line, steam piping, etc., including 3100 ft. 6-in. pipe.....	9,068 39	453 41	4.4
Retorts, etc.....	592 72	29 63	.3
Caleining furnace.....	700 51	35 02	.3
<b>CYANIDE PLANT.</b>			
Double treatment, capacity 2800 tons per month.....	38,740 88	1,937 04	18.9
Buildings, quarters, etc.....	38,319 81	1,915 99	17.8
Totals.....	\$204,370 65	\$10,218 50	

In order to show the comparative cost of plant in New York and F. O. R. Bulawayo, the figures referring to the cost of a horizontal, tandem, compound Corliss engine (size 18x28x42 inches; horse power, half) are segregated below:

	Total Cost.	Per cent. Total Cost.
Cost in New York.....	\$3,335 80	61.70
Commissions.....	162 00	3.10
Freight, prime, insurance.....	558 02	6.80
Port Elizabeth charges.....	65 85	1.20
Railway charges, Port Elizabeth to Bulawayo.....	1,883 84	26.30
Receiving and forwarding.....	33 39	0.62
Total cost F. O. R. Bulawayo.....	\$5,339 90	

The improved conditions obtaining at the present time, in respect to ocean transport, railage and local handling, as well as a favorable fluctuation in the initial cost of plant, makes it possible to keep within these figures.

**ASSAY PLANS.**—Upon most of those mines which

have reached an advanced stage of development, surface and assay plans, as well as sections and stoping plans are kept. While the data embodied in these plans vary somewhat on individual mines, the fundamental principles are adhered to.

The development as well as the stope samples are taken at distances of 5 feet apart, generally, (one being guided by local conditions in the selection) and are plotted weekly. The values are customarily shown in "red," and the width in inches in "black." All samples are taken over the actual reef width, which figures are adjusted to an assumed stoping width when calculating the possibilities of the mine.

In the opinion of the writer, the method often used (in instances where width of reef is under an assumed stoping width) of sampling beyond this stoping width, including both reef and country matter, is liable to produce very inaccurate results. It appears clear where the character and hardness of the rock and mineralized matter show a marked difference, it is almost impossible to obtain the proportions of each section necessary to insure reliable results. These remarks are particularly applicable to this country where so many narrow but highly auriferous veins occur, which have in many cases lent themselves more readily to oxidation than the adjoining rocks.

Sectional sampling is resorted to extensively, not only in development work, but in all stope breasts, in order to avoid as far as possible the handling of ore which will not leave a margin over and above the cost of mining and milling expenses. In this country the unit of value is the "dwt.," equal to \$1.03. In order that immediate approximations may be made of the stope breasts, daily stope samples are taken and panned, which after one has become familiar with the character of the gold and other conditions, furnishes very satisfactory results. All results plotted refer to fire assays.

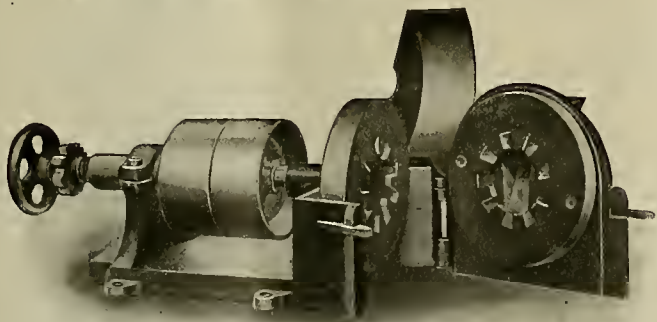
In order to avoid, as far as possible, inaccuracies in plotting the stope measurements, the writer prefers to have the individual stopes drawn to large scale upon separate blocks, and these are used for calculating tonnages, etc. The scales used for underground general plans vary from 20 feet to an inch to 60 feet to an inch, depending upon the extent of the property.

**DEVELOPMENT WORK.**—Generally speaking, the quartz veins occurring in this country may be said to be narrow. The lateral continuity varies greatly, but in rare instances does it extend over the full length of a block—1500 feet. The grade (when the widths are adjusted to a common basis and suitable areas are used in the calculation) varies upon working propositions from 8 dwts. per ton to 22 dwts. per ton.

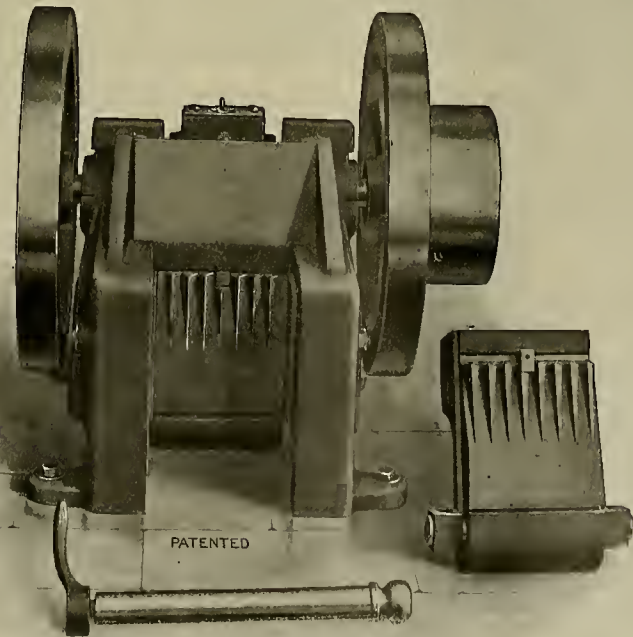
At the Wanderer mine, where a dry-crushing plant of about 300 tons capacity per day has recently been erected, the grade of ore being dealt with is stated to be under 5 dwts. per ton. In this case no underground work is necessary at present, the ore being quarried at small expense.

In common with other countries, when the industry is just emerging from infancy, Rhodesian ventures have suffered to that extent which is produced by the erection of reduction plants when there has been only a limited amount of development work accomplished, a mistake which is presumably made through an intense desire to record an output.

Usually at this stage in any country the conditions are abnormal, and if there is a period in the history of the industry which demands careful and cautious work it is at this time. However, where such large sums of money are required, as is the case in this country, the financial considerations are of first im-



Sample Grinder, Open.



Laboratory Roll Jaw Crusher, Open.



portance, and it appears to be necessary to take greater risks than in most other countries.

The period consumed in reaching the milling stage varies with the width and lateral extent of the vein being dealt with, but may be said to absorb from three to four years from the date that work is seriously undertaken.

The comparative cost of unskilled labor would suggest to those who are unfamiliar with other conditions that the expense of development work should be small. This is not the case, however, for, although the native wage may appear to be low, when the other expenses incident to their employment are considered, it is found that this account represents about 30% of the total cost of the work.

This condition is not clearly reflected in the figures given below, as the bulk of the work is accomplished under the contract system in that case.

The cost of stores, mining material, administration and many other incidental charges associated with mining operations in this country is very high. It is therefore essential that very large footages be obtained over stated periods, in order that reasonable distributions may be made of the "constants," observing that a large footage reflects favorably in the "cost per foot."

An analysis of the cost of development upon one of the properties with which the writer is connected is given below:

MINE DEVELOPMENT.			
	Total Cost.	Cost Per Ton Milled, Cts.	Total Cost, %.
Salaries.....	\$ 1,709 90	.044	2.47
White wages.....	3,538 88	.068	3.83
Contractors.....	22,110 67	.579	82.03
Native wages.....	3,885 49	.083	4.15
Native food.....	1,091 25	.028	1.58
Stores.....	2,693 96	.070	3.90
Maintenance.....	767 40	.020	1.11
Workshops.....	1,057 76	.027	1.53
Native hospital.....	290 12	.007	.42
Native labor supply.....	75 17	.001	.10
Pumping (underground).....	4,453 75	.116	6.50
Compound expenses.....	873 08	.022	1.27
Compressor and drills expense.....	16,570 56	.433	24.00
Hauling.....	1,621 67	.042	2.35
Underground tramming.....	2,750 95	.071	3.99
Manufacturing and sharpening rock drills.....	5,637 29	.146	8.18
Assay account.....	698 12	.018	1.01
Surveying and sampling.....	720 11	.018	1.04
Totals.....	\$99,176 01	\$1 80	

The footage executed over the above period was 2766 feet, representing a cost per foot of \$25 03, although if individual months when a full supply of labor was available should have been segregated a decrease in the cost per foot of about \$4.50 could be shown.

The tonnage dealt with over the above period was 38,054. The footages executed over given periods in this country are fair, although not to be compared with those obtained on the Rand fields, where I dare say greater progress is made than in any other mining country in the world.

With hand labor, driving in ordinarily hard ground, 40 feet per month is considered to be good work, while with machine drills 80 feet per month is a good average. On the Rand anything up to 200 feet per month is made in driving, while in shaft sinking the same footage is often executed.

Upon one property, with which the writer was connected some six years ago, no less than 260 feet of sinking was accomplished during one month of twenty-eight days, i. e., from the 1027-foot level to the 1287-foot level; at the same time ten drives were being extended from the shaft, the average footage in this latter work having been at the rate of 147 feet per month. The dimensions of the shaft were 17x7 feet.

The smaller amount of work obtained in this country is due very largely to inferior equipment, both underground and upon the surface, hence the rapid handling of large quantities of broken rock is in most cases impossible.

**WORKING EXPENSES.**—I believe that in Rhodesia the requirements of an engineer in respect to the number of properties he is expected to effectively handle are in excess of most countries. It is therefore necessary that detailed and complete records be kept of the work. The comparatively high and constantly fluctuating prices of mining material and supplies make it essential that constant quotations of these articles be obtained and filed for daily reference if any hope be entertained of effecting economy in operating expenses, as well as for the purpose of producing estimates which can be treated with confidence. The writer has in operation a system which, although appearing somewhat elaborate and entailing a good deal of secretarial work at the end of each month, is calculated to supply almost at a glance all of the information covering the month's work. The fluctuation in the operating expenses is clearly reflected and the factors which contribute towards these conditions are at once determined.

It is interesting to observe what an important bearing a fluctuation in the monthly tonnage handled has upon the operating expenses.

The foregoing remarks forcibly suggest the importance of correctly measuring the tonnages handled. In Rhodesia the methods obtaining in dealing with tonnages are not conducive to accurate results. The cars of certain calculated capacity are counted as they are delivered to the mill or crusher station, and this figure, less the number of cars which are discarded as waste (in all cases estimating

20 cubic feet to the ton), is calculated to be the tonnage crushed. This system is at fault, and it will be necessary to observe greater care in measuring the tonnages before a comprehensive comparison can be made between theoretical and actual results.

The above methods would be all right if, after determining the number of cubic feet to the ton in individual cases, each car delivered to the mill was filled to the same point and moisture samples were taken periodically. This, however, is almost impossible, at least, in this country. The stope measurements are, of course, used as a check, but it is hardly necessary to state that in either case only a very approximate result is obtained. This question is of so much importance, both as regards relative working costs, as well as relative stamp duty, as to suggest the adoption of a uniform and accurate method of measurement, at least in cases where the figures are to be filed for record or general information.

Scales should be used which automatically weigh and register the cars delivered. Then if each car be tared, and periodic moistures taken, a correct record of the tonnage handled would be obtained.

An analysis of the working expenses extending over a period of twelve months upon one of the properties with which the writer is concerned is given below, and it is intended that the points to which attention should be directed in order to effect economy will be reflected therein.

MINING.			
The tonnage mined during the above period was 44,011 and the tonnage milled amounted to 38,054:			
	Total Cost.	Cost Per Ton Milled, Cts.	Total Cost, %.
Salaries.....	\$ 4,462 88	.116	3.49
White wages.....	12,018 84	.315	9.34
Contractors.....	10,132 88	.266	7.39
Native wages.....	26,751 86	.700	20.78
Native food.....	10,889 82	.280	8.49
Stores.....	3,719 11	.096	2.88
Explosives.....	12,229 29	.320	9.49
Charcoal.....	41 46	.001	.03
Fuel.....	475 75	.012	.39
Maintenance.....	2,550 70	.066	2.00
Workshops.....	317 74	.021	.63
Transport.....	235 63	.006	.18
Native hospital.....	580 76	.014	.42
Native labor supply.....	220 67	.006	.19
Pumping.....	10,867 76	.284	8.44
Compound.....	3,620 68	.094	2.80
Compressor and drills.....	633 08	.016	.49
Manufacturing and sharpening hand drills.....	8,489 17	.220	6.50
Hauling.....	5,702 11	.148	4.42
Underground tramming.....	13,040 95	.338	10.05
Assay account.....	986 14	.026	.76
Surveying and sampling.....	321 31	.008	.25
Totals.....	\$128,787 65	\$3 88	

TRANSPORT OF ORE.			
	Total Cost.	Cost Per Ton, Cents.	Total Cost, %.
Salaries.....	\$ 289 29	.0076	7.40
White wages.....	130 55	.0034	3.40
Native wages.....	708 49	.024	18.40
Native food.....	315 45	.0090	9.05
Stores.....	221 33	.0058	5.60
Fuel.....	521 91	.0136	13.46
Maintenance.....	246 15	.0064	6.41
Workshops.....	50 67	.0012	1.25
Mill engine and boilers.....	726 84	.0188	18.74
Electric lighting.....	36 37	.0010	1.00
Transport.....	494 75	.0128	12.07
Native hospital.....	2 42	.0006	.13
Native labor supply account.....	2 42	.0006	.13
Compound.....	74 54	.0014	1.89
Totals.....	\$3,821 18	.1010	

(TO BE CONTINUED.)

## Wolfram, and How to Know It.

Written by B. DUNSTAN, Government Geologist, Queensland.

As wolfram is so much in demand at the present time, and inquiries are being constantly made as to its mineralogical characters, the following notes may prove useful to the prospective wolfram miner:

The physical characters of wolfram—color, luster, streak, specific gravity, cleavage, etc.—are all aids in recognizing it, and the wolfram prospector should be familiar with those characters, while he should also possess a knowledge of such other of its properties as can be readily tested by a miner in the bush. In addition to this, he should know the more common minerals mistaken for wolfram, and how to distinguish that mineral from them.

Wolfram is of a black or deep brownish-black color, and has a luster somewhat resembling black glass, but with a metallic or submetallic tinge. In breaking, it usually cleaves along flat, shining faces very much like antimony, and in this respect is very different from the conchoidal (or shell-like) fracture of broken glass. Where exposed on the surface this cleavage is not always present.

In handling the mineral, one is impressed with its heavy "weight"—or, more correctly speaking, its "specific gravity"—being much heavier than iron, not quite so heavy as lead, and about the weight of metallic copper.

The following list shows the specific gravity of wolfram compared to that of other substances: Wolfram, 7 to 8; magnetite, 5; hematite, 5; hornblende, 3; tourmaline, 3; titanite, 5; tinstone, 7; rutile, 4; glass, 3; metallic iron, 7; metallic copper, 8; metallic lead, 11; and water (the standard), 1. Water is used as the standard by which the specific gravity of minerals is estimated—the weight of a mineral compared to that of an equal bulk of water being its specific gravity—so that wolfram is between seven to eight times heavier than water, or roughly, half as heavy again as hematite.

The "streak" is the mark left when a mineral

is scratched by a substance harder than itself, and corresponds to the "powder" produced when the mineral is finely crushed. Minerals agreeing with one another in color very rarely have the same streak or powder, and this fact is useful in distinguishing wolfram from those minerals which otherwise it closely resembles. Magnetite, hematite, titanite, manganese-dioxide, tourmaline, tinstone, hornblende, zinc blende, chromite, black volcanic glass and coal are all black—or most of their varieties are—but vary considerably in the color of their "streak." The streak of magnetite, coal and manganese is black; that of tourmaline, tinstone, rutile, hornblende and volcanic glass is of various shades, but all light colored; while hematite, zinc blende, chromite and titanite iron more or less resemble that of wolfram in having a dark-colored streak tinged with brown or red, or having an admixture of these colors.

The "hardness" of a mineral is also a very useful test, and is usually determined by means of a file or hard-tempered knife blade. One mineral of known hardness may be employed to test the hardness of others not known, but it is found that, for testing common minerals, the ordinary knife blade answers most purposes. Titanite, iron, chromite, wolfram, hornblende and volcanic glass are about as hard as a common knife blade, while hematite, tourmaline, magnetite, tinstone, rutile and franklinite are all harder. Manganese ores vary so much that this test, in the hands of a novice, becomes unreliable. The hardness of wolfram varies from 5 to 5½; hematite, magnetite, franklinite and rutile are about 6; titanite, iron, between 5 and 6; zinc blende, 4; chromite, 5½; volcanic glass, 3; window glass, 4½; a file, 6½; copper coin, 4; soft copper, 3; common knife blade, 5; hard tempered knife blade, 6½.

In the absence of a mineralogist's blowpipe, a blacksmith's forge may be utilized for testing another property of the mineral. When heated without any flux, hematite, tinstone, rutile, franklinite, magnetite, chromite, zinc blende and titanite iron are infusible, or nearly so; tourmaline, hornblende, volcanic glass and wolfram are fusible; while coal—except the anthracite variety—will easily burn away.

As an example of the working out of the various tests, a blackish mineral is taken. Its weight at once impresses the observer, and a rough estimate shows it to be abnormally heavy. It would therefore not be hornblende, chromite, zinc blende, tourmaline, rutile or volcanic glass, but might be either wolfram, magnetite, hematite, titanite iron or tinstone. (Specific gravity test.)

A piece is very finely crushed with a hammer or rubbed with a file, but gives a "powder" or "streak" which is neither black nor light colored. Taking those among which the mineral might be found in the previous tests, it will be seen that it cannot be tinstone (light colored) or magnetite (black), but, being reddish or brownish, may be wolfram, hematite or titanite iron. (Streak test.)

A small chip of the mineral is next tested in a blowpipe flame, or a larger piece in a forge fire, and the mineral fuses or melts on the edges or corners; it is therefore not hematite or titanite iron, and is probably wolfram. (Fusibility test.)

A flake is broken from a sample and the clean, bright submetallic luster on a cleavage face is shown—the presence of the mineral is confirmed. (Cleavage and luster tests.) The order of all these tests may be varied according to circumstances.

A few remarks concerning tungstic ochre and scheelite, two other tungsten minerals, might be appropriate. Like wolfram, they contain a very high percentage of tungstic acid, and the wolfram miner should be on the lookout for them.

Tungstic ochre is an earthy mineral of a yellowish or greenish-yellow color, and results from the surface decomposition of wolfram. Scheelite is a whitish or yellowish-white mineral, about as hard as a common knifeblade (hardness = 5), is not as heavy as metallic iron or wolfram (specific gravity = 6), and frequently occurs with the latter mineral.

The minerals likely to be mistaken for scheelite are cerussite (carbonate of lead), anglesite (sulphate of lead), pyromorphite (phosphate of lead), barytes (sulphate of barium) and witherite (carbonate of barium).

Witherite and the three lead-bearing minerals—cerussite, anglesite and pyromorphite—are all fusible when heated alone in a blowpipe flame or in a blacksmith's forge, provided small pieces are used. If heated with bicarbonate of soda, in the proportion of 1 of mineral to 4 of soda, they can be reduced to metallic lead, while scheelite and barytes are only fusible with some difficulty and give no metal. Witherite and barytes contain the element barium, and in consequence give a greenish color to a flame when intensely heated alone.

Barytes and witherite may easily be distinguished from scheelite—first, by the color they impart to the flame, as indicated above; second, in being lighter in weight (scheelite = 6, barytes and witherite = 4½); third, in being softer (scheelite = 3½, barytes and witherite = 5); and, fourth, in having no connection with wolfram. The three lead minerals are associated with galena, although on the surface of an outcrop the latter mineral may not be present.

White arsenic is a rather heavy mineral, but not so heavy as scheelite (specific gravity = 3½), is soft



(hardness = 2 or less), makes white fumes having an unpleasant odor when heated in a fire or with a blow-pipe, and is usually associated with mispickel the whitish, metallic arsenical pyrites.

Antimony oxide (cervantite) is whitish or yellowish, has a specific gravity of about 4, a hardness of about 4, is infusible and is always associated with the metallic antimony ore (stibnite).

The above may be some guide to the wolfram prospector, but it would be very desirable, although impracticable, to put into the hands of every one supplied with this information small pieces of these minerals for reference, if only the size of a marble, and also pieces of the other minerals for which they might be mistaken. With the addition of a blowpipe, an ounce of bicarbonate of soda, a piece of candle, a pair of forceps, a block of charcoal, an elementary book on minerals, and a reminder at the start not to "know all about it," the prospector's testing outfit would be complete.

## Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 7, 1905.

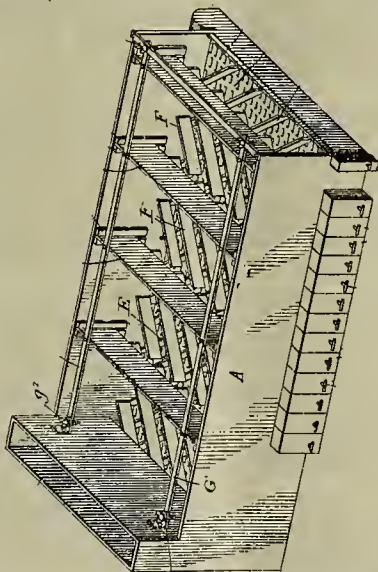
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF PRODUCING PURE COPPER.—No. 782,145; L. M. Lafontaine, Paris, France.



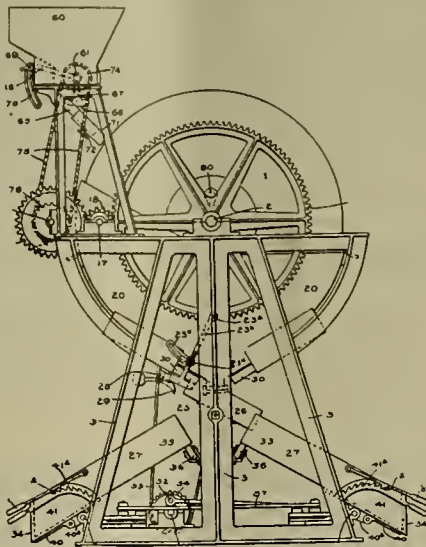
Process for refining copper by forming copper producing substances into plates, inserting plates with suitable cathode plates into electrolytic bath, which has previously been prepared by saturating water with sulphate of copper, then adding to same a quantity of sulphuric acid, then filtering liquid and adding calcined soot thereto, and directing current of electricity through cell thus formed.

ORE CONCENTRATOR.—No. 782,078; A. H. Stebbins, Little Rock, Ark.



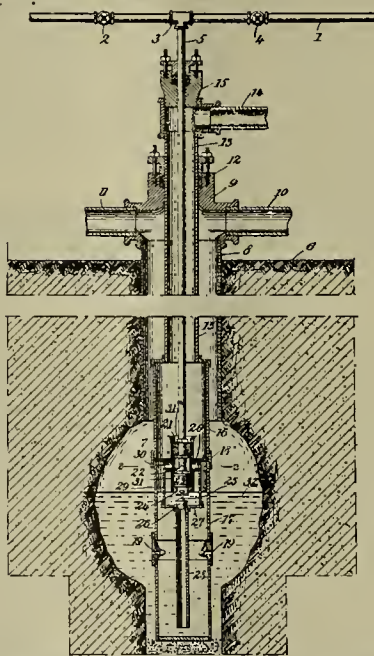
In concentrator, combination of frame, concentrating surface supported by frame, series of concentrate guides disposed diagonally over concentrate surface, series of tailing guides disposed above concentrate guides, concentrate and tailing guides being arranged at angle to each other, concentrating surface being formed of sheet material having perforations therein, walls of which are offset to direct fluid currents over or parallel to surface.

APPARATUS FOR ANHYDROUSLY CONCENTRATING ORES OR THE LIKE.—No. 782,118; G. H. Fettus, Philadelphia, Pa.



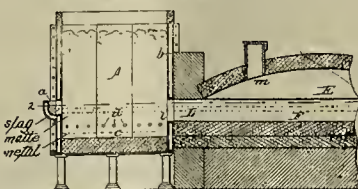
In apparatus of character recited, combination of horizontally revoluble drum, provided with conical end portions, and central cylindrical portion, interior and exterior communicating pockets, forming periphery of cylindrical portion of drum, together with means for supplying material to exterior pockets in ascent of rotation.

APPARATUS FOR RAISING LIQUIDS FROM DEEP DRILLED WELLS.—No. 782,040; T. F. Moran, De Young, and F. J. Moser, Kane, Pa.



In apparatus of character described, combination of casing provided with partition separating same into upper and lower compartments, tubular member connected with partition and provided with apertures disposed below same, air-pipe provided with packings engaging tubular member and apertures disposed intermediate of packings, apertures of air-pipe being disposed adjacent to apertures of tubular member, conductor pipe in communication with upper compartment and extending into lower compartment to point adjacent to bottom thereof, and means for preventing retrogression of liquid from upper compartment to lower compartment.

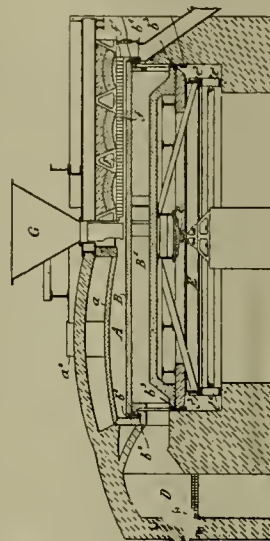
METHOD OF MATTE OR PYRITIC SMELTING.—No. 782,123; O. S. Garretson, Buffalo, N. Y.



Method of matte or pyritic smelting which consists in bessemerizing or converting matte by blast underneath column of material containing flux, maintaining flow of resulting slag to forehearth, supplying sulphur bearing material to slag in forehearth, while maintaining slag in freely flowing condition, thereby producing low grade matte which combines with metal or matte contained in slag, and maintaining

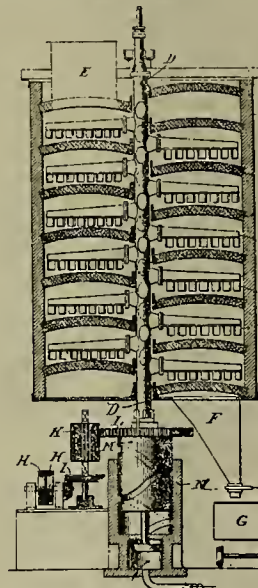
flow of such low grade matte back to bessemerizing or converting region.

ROTARY ORE ROASTING FURNACE.—No. 781,824; F. Heberlein, London, and W. Hommel, Lee, England.



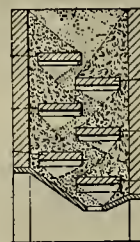
Rotary muffle furnace for roasting ores, comprising ore chamber floor of which rotates, heating chamber immediately beneath, rotating with floor of ore chamber, and stationary heating chamber immediately above ore chamber; heating gases being caused to circulate first through lower heating chamber and subsequently through upper one.

METALLURGICAL FURNACE.—No. 781,834; R. L. Lloyd and P. Thill, Greatfalls, Mont.



In metallurgical furnace, stationary longitudinally curved hearth for ore, in combination with ore feeding mechanism disposed in space between turns of hearth.

FURNACE OR KILN FOR ROASTING ORES.—No. 781,904; G. O. Petersson, Dalsbruk, Russia.



Furnace or kiln for roasting finely crushed ore, burning dolomite, etc., provided with flat arches b, c, d arranged in shaft at different levels zigzag with reference to one another, and having space between themselves and walls of shaft and with space beneath bottom arch or arches b communicating at one end with outer air and at the other end with fire chamber which in its turn communicates with one end of space beneath arch or arches c above, while other end of latter space is in communication with chamber h, in its turn communicating with space beneath top arch or arches d, space last mentioned communicating with chimney either directly or through aid of other arches compelling gases to flow repeatedly back and forth in furnace or kiln.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

(Special Correspondence).—The approximate copper production during 1904 was 206,000,000 pounds for Michigan and 204,000,000 pounds for Arizona, there being a gain during 1904 of about 15,000,000 pounds for Michigan and nearly 60,000,000 pounds for Arizona. Utah produced upwards of 50,000,000 pounds last year, almost exclusively from Bingham, in Salt Lake county. Montana also made a small gain, but no great increase is to be looked for from the Butte camp. Montana's prospects of future increase depend mainly upon developments in the new Corbin district of Jefferson county, where there is considerable activity and where there are several new properties of promise. In California there was an increased production, due to better conditions at the property of the Mountain Copper Co., in Shasta county. The Bully Hill mine, near the Mountain, also was a small producer. The Wyoming output during 1904 was very small. Washington and Oregon both made a little copper, but have not as yet opened important producing mines. South Dakota's production was confined to a few hundred thousand pounds, secured mainly in low-grade fluxing ores. Colorado secured between 6,000,000 and 10,000,000 pounds of copper yearly from cupriferous silver, lead and zinc ores. The plans of the Calumet & Hecla, at Lake Superior, call for the installation of one of the largest electric power plants ever constructed. The favorable developments on the Kearsarge lode in the two shafts of the Calumet & Hecla have directed attention to the Tecumseh, lying next south of the Osceola, which, in turn, is the southern neighbor of the Calumet & Hecla. The Tecumseh sunk two deep shafts—one on the Calumet conglomerate and one on the Osceola amygdaloid—without finding enough copper to render the shafts even fairly promising at any single point.

Houghton, Mich., Feb. 14.

### ALASKA.

(Special Correspondence).—The Klondike & Boston G. M. Co. has put in a complete hydraulic plant on Grubstake gulch at Willow Creek, and is the first and the only operator in the Sushetna valley, and will also install a Ruble elevator on Willow creek next season. Willow Creek, Feb. 11.

At present the coal production of Alaska is limited to a few thousand tons used for local purposes; but some of the coal-bearing areas promise well. It is reported that the Admiralty Island coal fields, in southeastern Alaska, have been practically abandoned. At one time the evidence of good lignite was promising. On the Bering river, 300 miles west of the Admiralty islands, near Controller bay, commercial veins of semi-anthracite coal have been found, resembling the harder bituminous coals of the eastern United States. Considerable work has been done at Homer, on Kachemak bay, in the Cook Inlet region. The Alaska Packers' Association get about 600 tons annually of lignite from near Chignik bay. In the northeastern part of the Seward Peninsula, on Chicago creek, a tributary of the Immachuk river, some good coal has been mined. Coal mining on the Yukon received a check when the river steamers put in oil burners. The Cape Lishurne coal fields, 300 miles north of Nome, have produced considerable coal, which has been sold at Nome for \$18 and \$20 a ton in competition with Comax and Washington coal. In 1903 less than fifty tons were sold to whalers.

In the Norton hay region evidences of coal have been found in narrow belts in Tertiary sediments on the Tubutulik and Koyuk rivers. In northern Alaska, in the Dall river region, a firm, bright lignite has been found in soft gray shales outcropping in the bed of Coal creek, 1 mile above the Dall river. An impure lignite is found along the banks of the Kowak between the mouths of Squirrel and Reed rivers, and it is probable that they occur in the lower valleys of the Reed, Salmon and Hunt rivers.

In the Mt. Wrangell district coal has been found near the head of the Chesna as a glossy lignite with conchoidal fracture in soft buff shales. It has been used by Slate creek miners for blacksmithing. Also, along the bluffs of Slate creek, below the mouth of Miller gulch, coal has been found which was used for the same purpose. Prospectors report considerable coal on White river, between the head of the Attul and the mouth of the Donjek. Coal has also been found on the Chesnina, Tazlina and Chitstone rivers, the latter being a dark-gray coal having many of the characteristics of cannel.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The Copper Queen M. Co. at Bisbee has resumed work on ground which has been lying idle since the fall in the price of silver. The Copper Queen formerly worked ore bodies which carried silver running as high as 700 ounces to the ton, but when silver fell these ores were left standing.

Bisbee, Feb. 14.

(Special Correspondence).—The shaft at the Leadville property, near Turquoise, is down 300 feet, a gasoline hoist having been used in the work. Drifts have now been started from the station and will be run south and west. A body of sulphide ore was run through during the last 100 feet of the shaft. A. J. Houle is in charge. The company has been incorporated as the Michizona M. Co.

Turquoise, Feb. 13.

It is reported that the management of the Calumet & Arizona, the Calumet & Pittsburg, the Lake Superior & Pittsburg, and the Pittsburg & Duluth M. Cos. and the Junction Development Co. at Bisbee have determined upon a consolidation. The capitalization under the reorganization and consolidation will be \$32,000,000. The

companies named have from the beginning been practically under the management of the Calumet & Arizona, being the parent of the other organizations. This mine has paid several millions in dividends since reaching the producing stage a few years ago, and has gathered a surplus of nearly two and a half millions. Its smelter is at present turning out at the rate of 350,000 tons of copper a year. An increase to double this capacity is expected during the year. Of the other properties none are as yet producing, although the Lake Superior, the Calumet & Pittsburg and the Pittsburg & Duluth are about ready to do so, having large ore bodies blocked out. With their coming in large expenditures will be necessary for reduction works and other equipments. The present joint capitalization of the companies aggregates about \$50,000,000. The new capitalization is thus a reduction. The stocks of the companies outstanding will be taken in the stock of the new organization issued at ratios of value which will fully protect all the present holders.

#### Maricopa County.

(Special Correspondence).—The Mormon Girl mill, in Cave Creek district, is closed down for a short time, as all roads to the mines are washed out and it is impossible to supply the mill with ore until repairs are made.

—The Oriental M. & M. Co. is installing machinery on its property in Cave Creek district.

Phoenix, Feb. 14.

#### Pinal County.

(Special Correspondence).—The new double-compartment shaft being sunk by the Troy-Manhattan Co. on the Buckeye vein, near the smelter ore bins, is 200 feet deep. The work of opening the levels to the east and west along the vein from the bottom of the shaft is progressing rapidly and the results are satisfactory. A large warehouse and a change house are being built on the main shaft dump. The management intends to put in a smelting plant of 100 tons capacity per day. The Buckeye ore when mixed with ore from the sulphide bed in the Rattler mine is self-fluxing. Thomas Kavanaugh is superintendent at Troy. J. W. Sisson is president.

—The test run of the Saddle Mountain M. Co. was a success. A 30-ton jacket was fitted up to make a five days' run. The ore proved to be self-fluxing and smelted so freely as to require from 50 to 60 tons of ore per day to keep the furnace running. After the test run was completed the old 30-ton jacket was taken down and is now being replaced by a new 150-ton jacket, which, owing to the excellent smelting qualities of the ore, will probably handle over 200 tons per day. G. B. Chittenden is the general manager at Dudleyville. This property lies at the eastern end of the Dripping Springs range, 15 miles from Troy.

Troy, Feb. 15.

(Special Correspondence).—It is reported that oil has been struck in a well that is being drilled on the San Pedro river, above Mammoth.

Mammoth, Feb. 13.

S. Burger of Salem, Mass., has contracted with A. C. Sheldon and A. G. Wilson for the Copper Peak group of mines, on the Gila river, 20 miles east of Florence. It is understood that they propose to thoroughly develop and equip the property in which they have become interested.

#### Yavapai County.

(Special Correspondence).—While the Poland M. Co. at Poland is unable to run its mill on account of the recent burning of the Val Verde smelter, which was treating its concentrates, active work is in progress in the mines. The drift from the tunnel on the Poland ledge is in about 2500 feet, and in going this distance good ore bodies have been encountered. A drift is also being run on the Accidental ledge on the Lynx creek side of the mountain from the tunnel, and a body of good ore has been encountered in it, as also on the C. O. D. ledge, which is near the Accidental. The drift on the Accidental, at the tunnel level, is from 840 to 850 feet deep.

Poland, Feb. 13.

(Special Correspondence).—Although recently published lists of Arizona's dividend paying mines place the United Verde at Jerome fifth, in reality it heads the list. Up to the present time it has paid a total of \$16,860,322, and for the year 1904 alone paid out in dividends \$1,800,000. The Arizona Copper Co. has paid total dividends of \$5,489,503; the Crowned King, Yavapai county, \$242,760; La Fortuna, Yuma county, has a record of \$1,062,500 paid in dividends; the Pride of the West paid its last dividend in 1901 at the rate of 3 cents per share. The total showing in dividends from the Standard Copper Co. is \$40,000, the last payment, 50 cents on the share, being made in 1903. Mines still paying big dividends are: The Copper Queen, Calumet & Hecla, Boston & Montana, Amalgamated, Anaconda, Calumet & Arizona and the King of Arizona. In another few months the United Verde will be one of the best mines for the miner to work in that there is in the Territory. Under the present management the mine is being brought into perfect ventilation and safety so far as cave-ins, etc., are concerned, and this mine bids fair soon to attract miners instead of, as in the past, being shunned by them.

The Pittsburg-Jerome M. Co. has located in the Jerome mining district, 2 miles south of Senator Clark's great United Verde mine, and the same distance north of the Copper Chief and Senator Clark's Equator mine, a producer located on Equator hill, is doing active development work.

Jerome, Feb. 14.

(Special Correspondence).—There are more men at Cherry Creek than ever before, and the forces on almost all the properties are being increased. At the Pfau the reduction works is being rapidly completed. At this mine the laborers are chiefly Americans—an unusual condition in Arizona, where Mexicans form a large percentage of the mine workers. The Gold Lode Co. recently purchased the Sessions ranch, which takes in the valley 1½ mile below the mines and has an ample supply of water for all purposes, also furnishing a good location for reduction works. The Gold Lode shaft is down 200 feet. The main tunnel on the Bugler has reached a length of 350 feet. An upraise from this to an upper tunnel, a distance of 130 feet, is all in ore. A winze is sunk in this lower Bugler tunnel at a point 245

feet in and has followed the vein down, being in high-grade ore.

Cherry Creek, Feb. 14.

D. C. Thorne of Prescott, interested in the Arizona G. M. & M. Co., in Santa Maria district, proposes to put in a dry crusher system of rolls and a 50-ton cyaniding plant. — A hoist, air compressor and other machinery has been ordered for the properties of the Baumann Copper Co. on the Agua Fria.

#### Yuma County.

H. J. Beemer of the Amalgamated Gold Co. is supervising the erection of a 60-stamp mill at Quartzsite, 100 miles from Martinez, the nearest railroad station. The company has a driller and will put down a hole 5000 feet, if necessary, to develop water. An electric motor train will be used to haul machinery and supplies from Martinez to the camp. The generator for this train weighs ten tons and is equipped with 90 H. P. engines and 75 H. P. generating motors. The cars weigh 4½ tons and have 3½ H. P. motors. On a good road fifteen tons to the car is a load. The speed is about 5 miles per hour, and when working full capacity about eight gallons of gasoline or distillate is used per hour. The water from the engines is thrown onto a netting and cooled by an electric fan and reused.

### CALIFORNIA.

#### Butte County.

The California State Mining Bureau reports the mineral production of Butte county for 1903:

	Quantity.	Value.
Brick, thousand	1,200	\$ 7,200
Gold	1571	1571
Lime, barrels	250	250
Limestone, tons	190	250
Mineral Water, gallons	13,000	1,550
Platinum	210	210
Silver	358	358
Total		\$1,581,825

The Gold Garden M. Co. is building a dredger on their land, near Wyandotte.

#### Calaveras County.

The '49 mine at Douglas Flat has been leased to a company who have placed W. Moyle of Vallecito in charge of the underground works.

#### El Dorado County.

W. J. Dingee, proprietor of the Eureka Slate Quarries at Slatington, will let contracts to clear a large tract of land to the north of the pit through which the main belt is known to pass. To expedite this part of the work the present force is to be doubled and an engine and dirt train will be pressed into service. It is estimated that the projected improvements when completed will more than double the present output of the quarries and even then they will have to be run to their full capacity in order to supply the present demand for slate.

#### Inyo County.

M. T. Stovall of Bishop states that work will be resumed on the Bishop Creek G. Co.'s mines as soon as the weather permits. — M. Jungheidel intends to build a sampling mill near Bishop in the spring. — The Mount Whitney mines, near Lone Pine, are stated to have lately uncovered an encouraging body of rich ore. A townsit, to be called Mount Whitney, is being surveyed by the company 1½ mile northwest of Lone Pine.

#### Nevada County.

P. Deidesheimer has a bond on the Morning Star quartz claim, near Cherokee, from J. Curnow, and will develop it and its extension on the Badger Hill ground.

The California-Grass Valley G. M. Co. will work the Chicago mine, near Grass Valley. D. E. Morgan is president; C. C. Haub, vice-president; G. H. Tuttle, secretary and business manager; W. P. Martin, superintendent. Last October the company took up the Chicago and has since cleaned out the old tunnel, run 800 feet of drifts and completed an air shaft 150 feet long. The company intends to build a mill and all the necessary machinery during the coming summer, all of which will be operated by water power. All the water necessary will be obtained at a very low rate, as it is turned back into the South Yuba ditch after being used. Water will be piped from the upper ditch to the mill, where it will have a head of 143 feet. Thence it will be carried to the lower ditch and liberated.

#### Placer County.

S. N. Dutchess of Newberry, Mich., owning the Alameda mine at Black Canyon, has let a contract to F. W. Snyder to run the main tunnel north and will start the mine about the middle of May. The shaft is 160 feet deep. The mine is equipped with a 20-stamp mill and concentrators, run by steam power.

The X Ray mine, in Sailor canyon, has been handed to G. E. Ward of Santa Cruz. He has four men at work driving a tunnel to tap the channel. J. H. Sunley is in charge.

#### San Bernardino County.

The Gold Park Consolidated Mines has been organized in Los Angeles to operate fifty-two claims in the Gold Park district of Riverside and San Bernardino counties. The company is planning to install a pumping plant on water lands recently secured and to build a pipe line 7 miles long to the mines. A mill is to be built on the ground. W. E. Winnie is president, D. D. Whitney vice-president, J. E. Schweng secretary and J. N. White superintendent.

#### Shasta County.

The air compressor and other machinery at the Mammoth mine, near Kennett, is now run with electric power furnished by the Northern California Power Co., which has a substation at the smelter site, between the mine and Kennett.

#### Siskiyou County.

Placer mining is the most important of the resources of northern Siskiyou county. This season the rains have been late, but now many of the mines are being hydraulicked, though somewhat hampered by difficulty of access. — The Siskiyou mine, near Happy Camp, is being worked by W. J. Brown, with ten men. The plants are working constantly. — The Van Brunt mine is being worked by Superintendent Jackson, for Eastern capitalists, with fifteen men and two giants running night and



day.—The Minetta B mine at Nolton is being worked by Superintendent T. J. Nolton with ten men.—It is expected that the Classic Hill, north of Happy Camp, will build a road to Waldo, Or., so as to cheapen cost of supplies. The mine is being worked with ten men.—The Medina G. M. Co., operating the Carson & Kradle and Gardiner ledges at Oro Fino, have struck a rich pay shoot of ore in both tunnels and are taking out a high-grade rock. They have started their mill and expect to keep it running. The new compressor and Burleigh drill plant at the Johnson mine, operated by the same company, are in place ready for operation.—W. H. Young of the King Solomon mine, near Cecilville, reports that the ledge has been struck in the new 800-foot tunnel. The company may put in a milling and cyanide plant when the wagon road can be extended from Black Bear.

#### Tuolumne County.

Superintendent A. J. Crowell has started up the Densmore mine, near Columbia.—At the Brindle Pup claim, near the Densmore, six men are at work. A steam hoist has been put in. W. G. Cole is foreman.—At the Dana mine, on Gold hill, B. C. Smith will commence operations with a hydraulic ram.—At the Now Calico mine, northeast of the Jumper mine, Stent, H. B. Parker states that a mill is to be built. Sufficient ore is blocked out in the mine to keep ten stamps busy for two years. G. H. Gerken is superintendent.—At the Republican mine, near Jacksonville, they are running three development drifts and two prospect crosscuts on the 500 and 650 levels. A new Dow duplex pump has been installed at the 650 level to handle the water. The 20-stamp mill is running steadily.

Work has been discontinued at the Dreisam, near Carthers, and F. A. Baier will do some drifting on the Good Luck this spring.—The Big Oak Flat claim, near Big Oak Flat, has been sold to the Monterey M. Co. by J. L. D. Roberts, T. A. Mitchell and J. F. Moore.

#### Yuba County.

F. K. Lord of Camptown, who recently located several miles of Canyon creek in the interest of a San Francisco company, will have a black sand plant erected in the spring to work the sand.

The old Council Hill mine, near Brandy City, is being worked by W. Reid.

### COLORADO.

(Special Correspondence).—For some time past traffic on the mountain railroads has been seriously impeded and, in some instances, entirely abandoned, on account of snowslides and heavy storms which have been raging in the mountains. The eight-hour bill, which is before the Legislature now in session, has been amended in such a manner that, if it becomes a law as amended, it will afford relief to but small proportion of the laboring class. The object of the bill as originally introduced is to grant relief to the smeltermen as well as the underground workers. The bill as originally introduced has met with strong opposition, and it is doubtful if any eight-hour measure is passed at this session of the Legislature.

Denver, Feb. 11.

#### Clear Creek County

J. Peterson of Clifton, Ia., and J. May of Cincinnati, O., president and secretary of the Golden Cloud M. Co., operating the Golden Cloud mine at the head of Virginia canyon, near Idaho Springs, may build a mill on their property.

The Corry M. Co., at Silver Plume, has taken a bond on the Wisconsin mine on Sherman mountain, thus averting litigation, as the owners of the Wisconsin had filed damage suits for \$100,000 against the Corry Co. C. S. Desch is superintendent.—Good progress is being made in putting up the framework of the Dives-Pelican mill at the Burleigh tunnel and it will soon be ready for machinery. The old air compressor formerly in use at the tunnel has been taken out to make room for the new boilers which will be installed to supply steam for the new compressor, and which are expected to arrive in a short time. The air pipe line which supplied the upper workings of the Pelican is being taken down so that the pipe can be used in other places. The crosscut being driven from the Burleigh tunnel to cut the Pelican and other lodes at that depth is being pushed as rapidly as possible in order to make connections. The company is spending a large amount of money in putting this property in shape for a greater ore production, and after the mill is in operation and the contemplated development work carried out the output of ore will be much larger than it has been for many years.

#### Eagle County.

The Spirit mine, adjoining the Iron Mask, at Gilman, is ready to receive the machinery. One stope of manganese is reported to be 300 feet long, without side, top or bottom as yet discovered. This will be marketed, while a force of miners is employed exploiting the second contact—the sulphide and the overtopping carbonates. W. F. Deaver of Leadville is the prime mover in the enterprise and W. W. Buell is superintendent.

#### Gilpin County.

The Penobscot M. & M. Co. is driving its tunnel from Gambell gulch, the main tunnel being 1436 feet. Manager P. J. Hamble says that the company may build a mill to treat its own product, but the matter will be delayed for some time in order to determine the real character of the ores in the property and the best process for treating them.

#### Gunnison County.

It is reported that G. Farnham will build a mill to treat an auriferous hematite ore recently discovered on the Niagara claim, in McIntyre gulch, near Ohio City.

The Taylor Park M. Co., T. T. Goodale, Boston, Mass., managing director, is working 8 miles south from Cooper's camp, near Dorchester. Local Manager A. E. Smith is employing thirty men and is shipping high-grade ore. The property is developed by three tunnels. No. 1 cuts the vein at a point near the outcrop. No. 2 cuts the vein 600 feet deeper and it is from a winze in this tunnel that the high-grade ore is being shipped. The values are in silver, gold and lead. No. 3 tunnel, which is now in over 3000 feet, will cut the high-grade vein in about ninety days at a depth of 900 feet below

tunnel No. 2. They have opened up an immense body of low-grade ore in this tunnel which will not bear the excessive transportation charges to ship out crude, as it costs \$18 per ton to take this ore from the mine to Denver and the smelting charges are \$8 per ton. When tests are completed showing the best method of treatment, a plant will be put in at the mine. There is sufficient water power on the ground to operate the plant. A telephone line has been constructed from the mine to Dorchester and will be extended to Aspen in the spring.—Superintendent Jensen of the Forest Hill mine, in Taylor Park, has a force of men breaking ore for the mill, which will start after the freezing weather is over.—Manager Erickson of the Climax property, at the head of Taylor river, will do considerable prospecting with a diamond drill in the spring.

#### Lake County.

(Special Correspondence).—At the Murphy shaft on the Iron Silver M. Co.'s ground on Rock hill, near Leadville, sunk by the Gnu Co., composed of W. G. Brown of Denver, M. Starnie, J. Harvey, Jr., and J. Murphy of Leadville, 368 feet from the surface, 20 feet of an ore shoot 6 feet wide has been opened up. The Iron Silver M. Co. is sinking a new shaft on the Dome, northeast of the Reindeer. Several lessees are sinking shafts to the south of the Reindeer.—The Rock Hill M. Co. leased and handed the Nil Desperandum, Robin Hood, Cornucopia, J. M. C. and Australasian claims. The old shaft on the Nil Desperandum is being sunk to the lower levels and drifting has been started to find the ore channel. C. S. Collins of Nashua, N. H.; E. A. Carter, L. F. Carr and W. G. Morse of Springfield, Mass., and S. Davis, J. H. Goodspeed and S. G. Collins of Boston, Mass., are interested.—The United M. & D. Co. of America has the south half of the Little Sister, Quig, Mike and George H. claims, 320 acres, and is sinking a shaft on the George H. claim. J. G. McNulty of Leadville is in charge.—F. H. Minard is sinking a shaft on the Parson, 1 mile southeast of the Little Sister borehole, to be sunk to the blue lime. Two other shafts are being planned to be started on the Owers land.—This territory on Rock hill has been prospected by boreholes and promises much for the prosperity of Leadville.

Leadville, Feb. 14.

#### Ouray County.

The deal whereby the Camp Bird Co. secured 51% of the Imogene G. M. Co. holdings, comprising eighty claims, means the driving of the crosscut tunnel of the Camp Bird 4500 feet farther in a direct line for the Imogene G. M. Co.'s tunnel in Spirit basin on the Red mountain side, which is now in 1500 feet. The contract is to be let upon the return from Chicago, Ill., of L. V. Jackson, general manager of the Imogene G. M. Co., for 1000 feet more of the same tunnel. The price paid by the Camp Bird Co. was \$400,000. Provision is being made by the Camp Bird Co. to handle the water they stand so much in need of, and which they expect to tap in the upper Imogene basin by the extension of the crosscut tunnel. There are 250 men working on the Camp Bird, and this force will be increased and work on the tunnel, both from the Camp Bird and Spirit basin sides of the range, will be pushed to completion.

The Belle Creole property in Eureka mining district, near the Sunny Side Extension, in Sunny Side Basin, has been sold to the Ross M. Co. of Pittsburgh, Pa., for \$100,000, by G. Howard of Howardsville.

#### San Juan County.

The Waldron M. Co., J. D. Bardwell manager, operating in the Mineral Point district, near Silverton, has sunk the Adelia shaft 200 feet deep and has commenced drifting both ways on the vein.

The Hamlet M. & M. Co. has started grading for its mill at Midland and for a track from the main road of the Silverton Northern Railway to the site of the mill. The new mill will consist of crusher, rolls, jigs and Wilfleys, and so constructed as to permit of additional units to the 50-ton plant, as requirements may become necessary with developments of ore bodies.

The first tube-mill plant in Colorado has been put in at the Gold King mill, near Silverton, consisting of four tube mills, 5 feet diameter by 14 feet long. These mills recrush the tailings from an 80-stamp mill to pass 50-mesh screen; pulp is then classified and reconcentrated on Wilfley slimers. This tailing plant has been in successful operation for two months.—The 300-ton plant for the Green Mountain M. & M. Co. is being stored away until spring. In the meantime, E. Walter is running intermediate levels, putting in upraises and blocking ore.

#### Summit County.

The Mineral Belt and Lucky mining properties on Mineral hill have been sold by S. B. Wright of Denver to the Beaver Creek G. M. Co., now operating in Buckskin gulch and on Silverheels in Park county. The Mineral Belt and Lucky consists of twelve lode claims and 2 millsites, on east slope of Mineral hill, 2½ miles from Breckenridge. The Lucky property has 3000 feet of tunnels and drifts and nearly 2000 feet of shafts. The longest tunnel is 1700 feet and cuts the four large veins extending through the hill. The main shaft is 600 feet and taps the extreme end of the tunnel to the mill. The other tunnel of 600 feet has already cut two of the veins and is nearing the third. The property is equipped with a concentrating mill of 50 tons capacity, pump and hoist. F. A. Yauger of Chicago is general manager and is preparing to begin work.—The Sallie Barbara, on Nigger hill, near the head of Australia gulch, has been sold by Wm. Robinson for \$10,000 to D. Gray and W. E. Bowden, Canon City and Leadville, who will put hoisting machinery on the property and operate it as a zinc-lead proposition. The old shaft is 270 feet in depth, and will be unwatered and the drifts put in shape for production.

#### Teller County.

The McKinney Extension G. M. Co. has twelve acres between the Anaconda and Mary McKinney near Cripple Creek, and will sink a shaft 300 feet. A hoist and air compressor are being put in by Manager J. Sharp.

The referees appointed by the United States District Court in Denver in the \$1,000,000 damage suit brought by the Morning Glory G. M. Co. against the Mary McKinney M. Co., for alleged illegal extraction of ore belonging to the plaintiff by right of apex, have filed their

findings in the United States court. Two of the referees find that the Mary McKinney Company owes the Morning Glory Company approximately \$64,000, while the third referee, in a minority report gives the plaintiff \$54,000. The plaintiff company brought suit to recover the value of ore taken by the Mary McKinney Company, which was claimed by right of apex to belong to the Aileen claim of the Morning Glory Company. Although \$1,000,000 damages was demanded, the plaintiff claimed that \$862,000 worth of ore had been extracted, while the defendant company claimed that only \$25,000 to \$35,000 worth of ore belonging to the Aileen claim had been extracted. The referee also found that the Mary McKinney Company extracted the ore at a cost of about \$21,000 less than the Morning Glory Company could have extracted it, owing to the facilities of the defendant company, and the Mary McKinney Company, it is understood, will make a strong fight for that amount, thus reducing the \$64,000 to approximately \$43,000. Should the minority referee's findings be considered by the Court the award will be further reduced by \$10,000. The referees are J. R. Finlay of Cripple Creek, former superintendent of the Portland; C. W. Howbert, manager of the Vindicator, and E. E. Chase of Denver.

A three-year lease on the Los Angeles, Six Points and adjacent ground near Cripple Creek has been taken by the Exposition M. & L. Co. and D. B. Hill from the Stratton estate. It is proposed to ship medium grade ore, of which there is considerable in sight, and to construct and operate a cyanide mill of 200 tons daily capacity. The Hill lease on this ground was surrendered in consideration of other concessions and the agreement of the lessees to engage in milling. A. Kenyon and C. Grant of Cripple Creek are interested. Ground has been broken for the mill. Machinery capable of crushing 200 tons a day will be installed, but for the present the tank capacity will not exceed 75 tons. Under the terms of the lease the construction of a 50-ton plant and the payment of 17½% royalty, flat, is required.

The Merger G. M. Co., which recently secured the Bonnie Nell property on Raven hill, near Cripple Creek, will sink the shaft down to the 1000-foot point.—Lessee Long and associates of Cripple Creek, who recently secured the Elkhorn and other properties on Tenderfoot hill under bond and lease, have commenced sinking the shaft, which is now down 450 feet.

All leases on blocks of Stratton's Independence mine at Cripple Creek have to be renewed. The renewal affects about thirty-five individual lessees and leasing concerns. Its limitation is six months, as before, and under the same terms as have been required in the past. Of the thirty-five lessees about 95% have shipping ore. The production ranges between 5000 and 6000 tons a month, having an average value in excess of \$25 a ton. Operations are being conducted under the general direction of Manager Becker.

### IDAHO.

#### Boise County.

The new vertical working shaft for the Lincoln mine at Pearl is down 160 feet, and will be sunk to the 500 level before crosscutting or drifting, says Manager G. Z. Edwards. The old shaft caved and was thought beyond recovery for permanent operations.

#### Custer County.

The White Knob Copper Co.'s property at Mackay is being worked by Receiver N. H. Clark with forty men. The main shaft is 700 feet deep, connecting with the 1500-foot Albert tunnel. The property is said to show a 23-foot vein carrying 3% to 9% copper, and \$1.75 to \$3 gold and silver. The mine is connected with the smelter by a 10-mile electric railway, having a maximum gradient of 6% in a rise of 2000 feet. The smelter has three 200-ton furnaces, and was blown in in September, 1902. The company was forced into the hands of receivers last October. It is stated that the trouble with the White Knob enterprise is that its expensive smelting plant and surface equipment were undertaken before the method of treating the ore was sufficiently worked out. The bodies of carbonate and oxide ores have continued down 700 feet in that altered condition to the Albert tunnel level, and experience has shown that the ore lacked sufficient sulphur for a successful matting method of treatment with which it has been attempted to work it, and too much sulphur for making base bullion successfully. The sulphur and copper content has shown increase in two short winzes that have been sunk from the Albert tunnel.

#### Idaho County.

(Special Correspondence).—The Sunday mine, at Big Creek, 35 miles from Warren, owned by S. D. Edwards of Logan, was located three years ago. A shaft has been sunk 50 feet. A tunnel is being run to cut the vein 100 feet below the shaft. This will give 160 feet of backs. The tunnel now is in 125 feet and the ledge will be cut early in May.—A rich body of ore has been opened up on the Edwards and Macy claims, the ledge running parallel with the Sunday vein.

Logan, Feb. 14.

(Special Correspondence).—It is stated that the Boyer mill at Elk City is to start.—J. Mason of the Gold Dove group, near Elk City, reports that their cyanide plant is completed and that they are waiting the arrival of the zinc and cyanide to start operations.

Elk City, Feb. 14.

The Crooked River M. & M. Co. expects to have its cyanide plant at the Hogan mine, near Elk City, completed by May 1. The 20-stamp mill is finished. W. Hogan is manager. Reports that mining and milling at the Hogan are being done for 60 cents a ton are confirmed by R. N. Bell, State Mine Inspector of Idaho, who says that this property carries a zone of altered granite country rock several hundred feet wide, traversing the company's property for several thousand feet, a shattered, schistose, silicified zone of movement that has subsequently been intimately saturated and impregnated with gold-bearing iron solutions, and now represents an average gold value through its great width conservatively estimated at between \$3 and \$4 a ton, of which it is said that 50% has been saved by simple plate amalgamation, and that 90% of the balance may be recovered by cyaniding. The gold disseminated through this mass



of mineral matter is generally very fine, but not all fine, for occasional cavities or seams are found crusted with iron oxide spotted with visible native gold. It parallels the valley of Crooked river, which affords a water power of large capacity. The property has been equipped with a 20-stamp mill, run by water power, and is worked by the glory hole method, which consists of quarrying the material into open raises connecting with a 500-foot tunnel driven in the zone from the back of the mill, where it is drawn off in cars and run out to the mill bin, and goes automatically through to the tailing pile. The mineral is very friable. Deep holes are put in with long churn drills and the heavy blasts thus prepared break it down in large quantities that call for little bulldozing, as the largest boulders can generally be readily broken small enough with a sledge to pass the coarse grizzly bars set at the head of the chutes.

Regarding work in the Thunder Mountain district during 1904, R. N. Bell, in his report as State Inspector of Mines, says: The completion of the Thunder Mountain wagon road, together with the increased bullion production of the Dewey mine, and the successful developments at the Sunnyside, gave the Thunder Mountain district around Roosevelt a boom during 1904, and the camp has made more real progress than during any year of its history. The new road has proven a success. The Dewey mine, the oldest in the district, is equipped with a 10-stamp mill, built in 1901, that had to be made in small sections so that it could be transported on mule-back. It is common experience for a patchwork mill of this kind to give lots of trouble and prove hard to hold up in repair, and this mill is no exception to the rule, but causes lots of trouble and loss of time to its operators to keep it in adjustment. While running, however, it has proven a great gold saver and demonstrated that in good hands the ores of Thunder Mountain yield a little higher percentage of their gross value to plate amalgamation than any other district in the State, close sampling of the battery heads and tails showing an actual recovery of 85% of the total value of the ore as free gold. The plant for an actual running time of seven months produced gold bullion valued at \$78,000. The average values of the ore treated during the year have ranged from \$10 to \$16 per ton. Thirty-five men were employed on the property during the greater part of the year, and in addition to the development of the mine, a great deal of road building and surface improvement was accomplished. The superintendent is Bert Haug. At the Sunnyside mine a crew of from 200 to 300 men were employed during the greater part of the year in the construction of the company's 40-stamp mill and aerial tramway, building roads and other surface improvements. All the machinery for this mill was hauled over the new road, placed in position and ready to run in December. The plant was started up but had to suspend operation immediately, owing to a defect in the tramway, which it is thought can be remedied. The weakness developed consisted of defective grips by which the tramway buckets are attached to the rope. These proved too weak to stand the strain over an unusually long, steep span on the line of the tram. These are to be replaced with stronger attachments. The slopes of the Sunnyside mine are reported to be in shape to supply 150 tons of ore a day. The mine has been quite extensively developed, and the work on the property seems to have demonstrated the occurrence of a blanket shaped deposit of tuffaceous igneous rock, 30 to 40 feet or more in thickness or depth, of wide extent and conformable to the general surface, but capped over at some depth by a barren sheet of harder, igneous formation.

The H. Y. Climax Co., which owns claims near the Dewey mine, have a hoist and sawmill on the property and have ordered a 10-stamp mill. They have let a contract for sinking their shaft to a depth of 400 feet. This company is employing thirty men. The Twentieth Century M. Co. has built a sawmill and are employing ten men in tunnel and other work. The East Dewey G. M. Co. has driven 350 feet of tunneling during 1904, and is now employing four men. There has been a large amount of development work done in the district by different companies and individuals during the year, of which detailed data is hard to obtain; the probably productive area has been widely extended, and intelligent investigation is being carried on at a good many points this winter; the total number of men employed in the different properties tributary to Roosevelt this winter is estimated at 500. At the Warm Lake district, on the Thunder Mountain road at Knox, the Trapper's Flat Co., managed by G. M. Snow of Nampa, are planning to erect a mill next summer. This company has built a sawmill. The Fidelity M. Co. property, located near the above, has similar strong fissure ore bodies containing big milling values and is being actively developed this winter.

#### Shoshone County.

(Special Correspondence).—The 16 to 1 mine at Wallace has closed because of a shortage of water. Fifteen men had been employed. Drifts had been run on the 200 and 400-foot levels, and a raise has been driven from the 200 to the 400-foot level. The mine is now in position to keep the mill supplied with ore.

Wallace, Feb. 13.

The crosscut tunnel of the Nine Mile Co., 3 miles up Nine Mile creek from Wallace, has been driven 150 feet. This extension of the tunnel was undertaken on the advice of the engineers of the United States Geological Survey, who were there last summer and gave it as their opinion, after examining the property and going carefully over its vicinity, that the workings were in a break and would have to be extended 200 to 300 feet to catch the ledge.

It is reported that 150 men will be employed on the Con. Black Cloud & California and the Panhandle mines, 2½ miles from Wallace, on Nine Mile. These properties have passed into the hands of the Heinz Lead & Silver M. Co. of Pittsburgh, Pa. C. H. Maiden, representative of the company, is at Wallace, and under his supervision continuous work has been in progress on the mine. A shaft is being sunk near the mouth of the tunnel to a depth of 200 feet. After taking hold of the Panhandle, the company began negotiations for the California and Black Cloud, situated on the opposite side of the canyon. These are among the oldest and best known locations in

the district. Both have been extensively developed by tunnels and drifts, and from both of them ore has been extracted and shipped. This is particularly true of the California, which, it is said, has paid \$60,000 to \$70,000 in dividends. At the present time, we are informed, there is no less than 500 tons of milling ore in the California bins. The concentrator on the Black Cloud will be started as soon as the water supply is sufficient. J. H. McClarren of Pittsburgh, Pa., president of the company, is expected at Wallace to begin operations on the consolidated properties.

#### Washington County.

The Ladd Metals Co.'s smelter at Landore is shipping matte and is handling sixty tons of ore daily. The matte comes from the smelters as bricks, 24x10x12 inches, and each one weighs 400 pounds.

E. D. Ford, manager of the Salzer-Ford Co., operating at Black Lake, reports that the new mill has been running since October 1 and has been reducing from 1200 to 1500 tons of ore monthly. The ore is crushed through a 12-mesh screen, run into the cyanide vats and left standing four days in a solution of 1%, effecting 92% saving. The cost of milling the ore, including the refining of the bullion and all labor about the mill, is \$1.30 a ton.

#### MISSOURI.

##### Jasper County.

(Special Correspondence).—A good zinc strike has been made by the Sunshine M. Co., 2 miles east of Joplin. They may build a mill. The company is composed of W. Fabrenbach, G. Muenig, W. Drawe and G. Blinzler of Joplin. E. E. Farrell has a good lead prospect on the land south of the Ten O'Clock mine, south of Carterville. The Sparks, Henderson & Stevens mill at Badger is producing close to 100 tons weekly. This mine, on the bank of Spring river, has done much toward exploding the theory that zinc could not be found under limestone. The company is preparing to erect a new 150-ton mill. E. B. Rankin, F. M. Smith and F. M. Cummings of Joplin have sold their mine on the Guengerich land, southeast of Joplin, for \$50,000 to the Lyman G. M. & Co., who propose to work the mine on a larger scale and will begin the construction of a mill. C. C. Wolcott, manager of the New York Zinc Company's land, southwest of Galena, has returned to Galena after a business trip to New York and will start up his mines as soon as possible. For several months the company has had considerable trouble in keeping the ground drained and has spent much money. The latest development of the sheet ore region has been on the C. M. Wilson land. Drilling proved that the blanket vein of zinc and lead extended in that direction and the Winslow M. Co. has been the first to sink the shaft, open up the ground and erect a mill. Eight drill holes showed ore at a uniform depth of 200 feet. The officers of this company are: A. L. Wolfe, Parkville, Mo., president; A. W. Yous, Mound City Mo., vice-president; W. M. Hamsber, Mound City, Mo., secretary and treasurer. The Bullfrog mine, 2 miles south of Joplin, is the largest hand jig mine in the district. Sixty tons of ore have been taken from this mine in a week's operation. J. J. Wickham of Joplin, superintendent of the company, is figuring on erecting a new 100-ton mill.

Joplin, Feb. 13.

#### MONTANA.

The San Francisco, Idaho & Montana Railroad Co., W. P. Mason of Minneapolis, Minn., president, will hold a meeting in New York on February 23 to decide when construction shall begin. They will build a railroad from San Francisco, Cal., to Butte, Mont., a distance of 923 miles, of which 308 miles will be in California, 215 miles in Nevada, 99 miles in Oregon, 284 miles in Idaho and 92 miles in Montana. The route is via Marysville, Oroville and Susanville, Cal.; Old Camp, McGarry and Mason, Nev.; Jordan Valley, Or., and Boise, Ida. There will be a branch line from Mason to Winnemucca, Nev. The road has been surveyed from San Francisco, Cal., to Boise, Ida., 578 miles, and is under survey from the latter point to Butte, Mont., 345 miles. All the bonds have been subscribed and the road will be completed by June, 1907. The country through which the line will pass is undeveloped. Timber, grazing and agricultural lands predominate. The preliminary surveys have all been made. The company has already let several contracts and will receive bids for the rest of the work as fast as the surveys are completed. C. H. Fleming of Minneapolis, Minn., is vice-president; W. E. Foray of Boise, Ida., is treasurer; J. Q. Burbank of Boise is chief engineer, and G. F. Propper of Boise is secretary.

#### Fergus County.

It is announced that the Moccasin Mountain M. Co., owning 500 acres of ground in the Moccasin district, near Lewistown, will soon begin development. Diamond drill explorations have been carried on for several months under the personal direction of W. Moore, with the result that good values have been shown to exist and the ore zone to be an extensive one. The Moccasin is a cyaniding proposition and it is intended to erect a large mill as soon as the development work justifies. The incorporators and trustees are: A. L. Emerson, J. R. McKennie, J. H. House and D. N. Heizer of Colorado and D. R. Beatty of Beaumont, Tex. S. S. Hobson is representative, at Lewistown.

#### Granite County.

Regarding the Boulder district, near Princeton, the Phillipsburg Mail says the sedimentary formation starts at Flint and consists of Cretaceous limestone, about 3000 feet thick, Triassic red sandstone, about 2000 feet, then a bed of quartzite, about 1000 feet in thickness, and on the south side, toward South Boulder, slate or shale for a long distance. At Princeton we find the lower Silurian formations intersected with quartzite. These lower Silurian formations consist mostly of dolomite which is cut by garnet porphyries and shows immense ledges of iron oxides assaying sometimes well in gold and some silver. On Sugar Loaf mountain, ½ mile from Princeton, there is a body of silver-lead and zinc-copper ore which in the past has brought good returns from shipments. The garnet porphyry sometimes carries nuggets of native copper ore assaying as high as 60%. The iron lodes run-

ning parallel with the garnet reefs have never been tried in depth. Sometimes, like in the Gold Hill, they have chimneys which are rich in gold. More than \$30,000 have been taken out at the Gold Hill, which is owned by P. J. Brophy of Butte and the Huffman brothers of Phillipsburg. Magnetic iron occurs in immense bodies. In some of the gulches cinnabar is also found. The Princeton M. Co. of Butte have a silver property 2000 feet from Princeton which is not being operated on account of some friction among certain stockholders in France. Two miles north of here is Princeton gulch, where many thousands of dollars in placer gold have been taken out. Going east from Princeton we still have the lower Silurian limestone for about 18,000 feet until we reach the Mount Powell mines where the formation is occasionally interrupted with granitoid porphyries. About 2 miles south of Mount Powell are the Race Track mines, which lie mostly in the granite belt. Still further south and west are the Red Lion and Cable districts with several bonanza mines, and then the famous old Granite which has produced millions and is still keeping up its record. From Mount Powell mines, at an elevation of 9000 feet, climbing in a northerly direction along the main range, we come to Goat Mountain. Here we find the tilted Cambrian quartzite resting on the Archean granites and cut by granite porphyry. The entire mountain is faulted on veins carrying gold, silver and copper ores assaying high in these metals. Most of the claims here are owned by Phillipsburg parties who work there spasmodically and make occasional ore shipments. Looking East from here we see in about 3 miles distance the highest mountain in Montana—Mount Powell. The country there is very abrupt and the formation is mostly of granite. Here numerous small creeks have their source. There is little Rock creek. Lost creek, Dempsey creek and others. Looking west from Goat mountain, on the contact of granite and slates, we see Finley basin which has good copper-silver-gold claims. Still farther west, and joining the claims just mentioned, are the claims of the Albion Mining Co., carrying the same character of ore as that found in Finley basin. About 1 mile farther west we reach the Royal country which is in the Archean granite, cut by granitoid porphyries. The ores here are principally gold ores, free milling, running well in gold. The principal mine here is the Royal, which has produced upwards of a million in gold.

Adjoining the Royal is the Sunday mine, which is in the same formation with the same character of ore. One mile north from there, still in the granite formation, is the Blue Bird mine, owned by C. Schille. The ores here carry copper, lead, silver and gold. One mile west of here is the Frank Walgren group of claims, fairly well opened up and shipping ore in sight. Four miles north from here is Rose mountain and Pike's Peak, where are located some splendid properties, and which section has a great future. Turning back south-west over a good wagon road, we come to the Nonpareil mine, which has produced quite an amount of lead-silver ore in years past and is likely to be started up again soon. This property is in lime formation. One-half mile from here is located an immense ledge of iron ore (oxides) assaying 65% iron and a little gold and silver for the average width of the vein, which is about 160 feet. The lead can be plainly traced a distance of over 3000 feet. It is owned by Princeton parties. The town of Princeton is 4½ miles east from Flint station at an elevation of 5500 feet. From the railroad station at Flint to the head of Boulder creek is 11 miles. There is a good wagon road toward the Mount Powell and Royal mines. Most veins in the lime formation run northwest by southeast, and east and west in the granite. The country around Princeton is much folded and faulted. Some faults can be traced for a distance of over 6 miles and quite a few ledges occupy fault fissures. South of Princeton, about 3 miles, is the Gold Reef group of mines. The lodes here are mostly in slates and porphyries. They are of good size and carry good values, principally gold. Some of the ore also carries telluride. There is a considerable amount of development work being done there. A modern stamp mill is being built to treat the ores.

#### Silver Bow County.

Much alarm is felt by Butte people because the streets are settling. It is stated that mining operations are going on within ten feet of the surface, and that in consequence the streets are in dangerous condition. The greater part of Butte is built over mines, and at times it is possible to hear the miners at work in tunnels beneath the surface.

#### NEVADA.

##### Esmeralda County.

The Nevada Coal Co., owning the coal mines at Coal-dale, 3 miles from the Tonopah Railroad, and in which F. A. Keith, T. L. Oddie, H. A. and A. Tripp are interested, will prospect the deposits with a diamond drill with a capacity of 1500 feet. The croppings are lignite and it is hoped to find a semi-bituminous coal with depth. A gasoline hoist is to be put on the Daisy mine, at Diamondfield, by the Diamondfield G. M. Co. A. S. Watson is manager. The 5-stamp mill at Silver Peak has started.

V. T. Hoggatt of Denver, Colo., has bought from L. Harris and partners seventeen claims near Amargosa, and have organized the Lige Harris-Bullfrog M. Co. to develop them. The Goldfield-Sovereign M. Co. has purchased from F. E. Horton and T. Henry, R. T. Brackney and L. Griggs claims ½ mile north of the Kendall mine, near Goldfield. F. E. Horton of Goldfield is resident manager. The Goldfield-Combination M. Co. has been formed at Goldfield by W. T. Liggett, D. S. Karns, J. P. Sweeney and H. C. Davis to work the Combination mine, which they have bought.

##### Lincoln County.

The Deer Lodge M. Co., operating at Deer Lodge, 24 miles from Uvada, Utah, will put in an air compressor to rush work on the 900-foot tunnel being driven to cut the ledge; the tunnel has been run 165 feet. E. D. Trenam is manager.

G. Surr is building a 25-ton cyanide plant to treat the tailings from the Cyrus Noble mine near Searchlight. The shaft of the Quartette mine at Searchlight is



nearly 800 feet deep. The west drift of the 700-foot level is in 75 feet in good ore.

The Moapa G. & C. M. Co. has been formed at Provo City to work claims in the Cane Springs mountains. S. K. Roberts is president, J. K. Bishop vice-president, H. G. Blumenthal secretary and J. W. Lamb treasurer—all of Provo.

#### Nye County.

(Special Correspondence).—W. A. Stanton, who has returned from the Kawich mining district, 70 miles east of Goldfield, reports that the same geological conditions are present in Kawich, and the surface showings are the same as those in the Goldfield district. Two hundred men are now in the district, and most of these make Goldfield their headquarters. Fifty buildings have been constructed.

Goldfield, Feb. 13.

#### White Pine County.

J. Ferren, superintendent of the Glasgow & Western Exploration Co., developing the Star mines at Cherry Creek, states that the company is sinking the shaft deeper and will not stop until it is at least 1000 feet down. More powerful machinery will be put in.

### NEW MEXICO.

#### Grant County.

At Hanover, J. W. Bihlo has purchased the Humholdt mine from J. Schlosser and R. La Franz; the Copper Kettle, Copper Queen, Mabel and Feltus mines from C. Abrahamson, H. Feltus, W. Welty and C. McCarthy, and the eight claims of the Pinto Copper Co. in the Central district. These last show four veins carrying carbonate and sulphide ores said to average 20 feet in width, and to carry good values in copper, silver and gold.

#### Otero County.

The Standard Lithographic Stone Co., 6 miles north of La Luz, on which work has been in progress for some time, is putting up extensive works for the preparation of lithographic stone for the market. The stone found on the company's property has been carefully tested, and has been found equal to the best Bavarian stone. The company is making arrangements to put it on the market on a large scale. The plant includes a gang of twenty saws, a polishing machine, compressed air drills and other machinery. Power will be furnished by a 50 H. P. engine. The machinery has been received and is now being erected, but it will probably be two months before it is in complete working order. In addition to the machinery for preparing the stone, the company intends also to put up a plant to make cement and other by-products from the waste and refuse incident to quarrying and preparing the stone. This will be the first place where lithographic stone is worked in this country on a commercial scale.

#### Rio Arriba County.

Through an injunction the Dillon Dev. Co., which has been operating a property in the Bromide mining district, has closed down and the Bromide Mining Co., which claims to be the original owner of the property, has taken charge. The Dillon Dev. Co. has developed the property extensively, installed machinery and erected buildings on it. It is said that the old company, composed of St. Louis men, will resume operations at once.—The New Mexico G. & C. M. Co., with offices at Tres Piedras, are working the Strawberry mine in the Bromide district. This shows fissure veins in schists and contact veins between schist and granite. R. Cole is superintendent.

#### Socorro County.

It is said that the Dividend M. & M. Co. of Estey City, which owns a leaching plant and 100-ton smelter, is contemplating removing the same from Estey City to Alamogordo. At present the company is unable to run the plant owing to lack of water. If the leaching plant and smelter were removed to Alamogordo they would be midway between Jarilla and Estey City, and the ore could be easily hauled to the smelter.

It is reported that the Tri-Bullion M. Co. will put in a concentrating plant at the Kelly mine at Kelly. H. Paschal is general manager at 307 Dearborn Building, Chicago, Ill.

### OREGON.

#### Baker County.

Operations at the Taber Fraction, near Bourne, continue from the lower levels of the Columbia mine, giving a depth of 1100 to 1200 feet.—The Sumpter smelter has put on double shifts, doubling the capacity of the plant. All of the bins at the smelter are filled, and the management has been forced to adopt many expedients to accommodate the daily tonnage. After two shifts start at the furnace, the surplus will be worked off, and until receipts increase further, the smelter will be able to handle ore as it is delivered. New bins have been arranged and these will be kept full while deliveries are constant.

More than 9000 feet of flume has been finished in the ditch system of the Oregon M. & I. Co., and Manager F. W. Talmage of Sparta will build further in the spring. The enlarged system of this company will deliver much more water from Eagle creek to the Sparta district, and enable placer owners to work larger acreages. The canal is the largest yet completed in this part of Baker county. It took for its nucleus the old Sparta placer ditch, which has been enlarged and extended. The result of the company's work insures heavier placer operations in Sparta next spring than the district has seen for many years.

#### Grant County.

Z. Houser has started his 5-stamp mill near the Standard mine, near Pralrio City.

#### Josephine County.

Manager A. B. Cousin and Superintendent E. F. Terry of the Galice Con. placer mines, near Galice, state that the bedrock flume being built by the company to work the bed of Galice creek from the Rogue river bar is progressing rapidly, and that four giants are in steady commission. They intend to install the Campbell tubular elevator on Gamhler's bar, at the mouth of Rogue river, as soon as the spring freshet of the Rogue is past. As the bedrock of this bar is but a feet above the river, it has never been deemed amenable to hydraulic meth-

ods. By means of the elevator this will be overcome and the Galice management will wash the entire bar, which embraces about sixty acres of promising placer ground. The highline ditch will be extended so as to reach the ground with a pressure of 300 feet to handle 1500 to 2000 cubic yards of gravel a day for seven or eight months of the year.

The Mt. Pitt M. & M. Co. are treating high-grade ore from the Climax mine in the upper Jump-off-Joe district in two tuh arrastras run by water power. A. C. Hooper has charge.—The Harmon-Green placer at Galice is being worked by T. K. Anderson.—F. V. Metts and O. L. Leigh have driven 900 feet of tunnel to drain the Silver Creek basin preparatory to mining the rich detrital deposit.

#### Malheur County.

At the Uncle Sam group, Mormon basin, near Malheur, sinking is being pressed since the new hoisting plant was completed. The management announces the purpose of going to the 300 level immediately, cutting stations and drifting each 100 feet. Lumber is being manufactured for a milling plant, which is a part of the year's programme.—Twelve to fifteen men are working at the Hattie B. property, Mormon basin. The property is owned by the Commercial M. & M. Co. of Portland.

### SOUTH DAKOTA.

#### Lawrence County.

The Spearfish M. Co., near Spearfish, has put a hoisting plant at the main shaft to explore the lower ore contact recently opened up.

#### Custer County.

The second shift of men has been put on at the Saginaw mine, near Custer. At the 250-foot level in the shaft a crosscut is being run toward the three parallel veins of ore. The shaft is also being sunk deeper. This company intends to build a cyanide plant in the spring.

### WASHINGTON.

According to the United States Geological Survey reports, the mineral output of Washington for 1903 was:

	Value.
Coal (3,163,273 tons).....	\$8,380,954
Clay products.....	928,265
Gold.....	507,885
Silver (294,500 ounces).....	159,080
Coke.....	214,776
Gas.....	429,963
Quarry products.....	594,343
Copper (80,756 pounds).....	10,820
Lead (538 tons).....	45,500
Coal tar.....	23,210
Mineral waters.....	10,550
White arsenic.....	36,691
Total.....	\$9,342,097

#### Kittitas County.

The Washington Quicksilver Co. has sold its property near Roslyn to D. C. Corbin of Spokane for \$400,000. An electric road will be built from Roslyn to the properties, a distance of 30 miles.

#### Okanogan County.

(Special Correspondence).—The Ruby M. Co., on Chopaca mountain, near Nighthawk, which has been doing prospecting and development work on its claims for eighteen months, has uncovered ore that assays \$50 a ton. A shaft was originally sunk 200 feet on Chopaca mountain and two crosscut tunnels were run. Exploration of the main ore body shows that the vein is from 3 to 20 feet in thickness. It has been uncovered 200 feet deep and 1400 feet in length. The main body of the ore is a soft sulphide, easily worked and lying in an outside casing of talc, surrounded by granite. The values are silver, gold, copper and traces of zinc and lead. The shipping ore averages \$50 a ton. Five hundred tons have already been taken out, and six 200-foot shoots in the mine have been filled. J. M. Haggerty, the president of the company, has been East with a quantity of samples of the ore, in order to have analysis and a reduction process devised. Baker & Burwell, Ohio, have devised an electric chlorination process, and will install a 20-ton plant at a guaranteed maximum cost of \$2.50 per ton. The electrical current is to be supplied by the Similkameen Falls Power & Development Co.

Nighthawk, Feb. 13.

#### Stevens County.

(Special Correspondence).—W. H. Plummer, secretary and manager of the New National C. Co., has taken up the \$75,000 bond on the Butte mines, near Springdale, and has started work under the superintendency of T. Hye. The Butte group has been developed by 600 feet. Springdale, Feb. 13.

(Special Correspondence).—The Frisco Standard M. Co. on Fish creek, 16 miles northeast of Northport, will install a concentrator at the mine.—L. P. Larson, manager of the Last Chance, on Deep creek, east of Northport, is working the Washington group on Red Top mountain.—The Galena Queen, on Stoddard mountain in Deep Creek valley, in sinking a shaft 100 feet by contract. The property improves in galena.

Northport, Feb. 13.

### FOREIGN.

#### BRITISH COLUMBIA.

##### Boundary District.

According to Manager J. P. Graves in the official statement of the metal produced by the Granby Con. Co. in 1904, nearly the entire output of the smelter came from the ores of the Granby mines. No outside matte was converted and the volume of custom ore which was handled was small in 1904. The Granby Co.'s metal output was: Copper, 13,431,226 pounds, at 12.8c, \$1,719,196; gold, 47,968 ounces at \$20, \$959,360; silver, 180,844 ounces at 57c, \$103,081; total, \$2,781,637. The Granby Co. has bought the Monarch group for \$160,000.

The tonnage of ore shipped by the several mines of the Boundary for January was: Granby mine, tons, 40,450; Mother Lode, 13,696; Brooklyn-Stemwinder, 6849; Rawhide, 2251; Sunset, 726; Mountain Rose, 682; Emma, 1849; Oro Denoro, 298; Senator, 918; Providence, 50; Elkhorn, 50; Skylark, 39; Last Chance, 43; E. P. U. mine, 65; Bay, 42; miscellaneous, 75. Total tons, 68,083.

#### Nelson District.

The Ymir mine at Ymir has seventy-five men employed at the mine and mill, and there is no immediate prospect of any further reductions. The cutting down has been caused by the cessation of development work on the deep levels. Meanwhile the stamp mill is crushing ore from the upper levels, where there is now enough in sight to supply it for some time to come. The Ymir mine, like many other mines in the province, has this year been severely handicapped by a scarcity of water, which has necessitated running the stamps by steam power. As wood is now somewhat scarce in the immediate vicinity of the mine, this has made milling a much more expensive process than in the past, and the profits obtained from milling under these circumstances do not admit of much expenditure by way of development. As soon as the snows begin to melt, however, there will be an abundance of water for all purposes. The 80-stamp mill has 850-pound stamps with a 6½-inch drop, ninety-eight to the minute. Narrow mortars with No. 9 and 11 diagonal slot screens have been used, the height of discharge being 3½ to 5 inches. The crushing capacity has been from 2½ to 3 tons per stamp per twenty-four hours. The ore is white massive quartz containing 8% to 12% of pyrite, sphalerite and galena. E. C. Holden has reported the saving on the plates to be 61.9% of gold values and 9.4% of silver. The saving in the concentrates was gold 16%, silver 35.4%, lead 42%, giving a total of 77% extraction. The vanner tailings are cyanided. G. H. Burnhart is manager.

#### Southeast Kootenay District.

(Special Correspondence).—A meeting of the Golden River M. Co. will be held on the 20th of March at Seattle, Wash., to increase the capital stock. Machinery will be installed during the coming season. R. J. James of Seattle is one of the trustees. The company is working on Bull creek, intending to divert the stream and mine the diggings in the bed of the river.

Fort Steele, Feb. 12.

#### Victoria District.

M. K. Rodgers, acting for the Daly Reduction Co., which owns the Nickel Plate, in the Similkameen, has bonded twenty-five claims on the Bonaparte river, near Ashcroft, for \$500,000.

#### Yale District.

(Special Correspondence).—S. Henderson of Ashcroft has sold the big copper mine on the Savona, 12 miles from Ashcroft, to the Marcus Daly people, for \$150,000. Ashcroft, Feb. 13.

### CANADA.

#### Yukon Territory.

The Department of the Interior of British Columbia publishes the following regulations governing mining in the Yukon Territory: Dredging: Six leases of 5 miles each may be granted to a free miner for a term of twenty years, renewable. The lessee's right is confined to the submerged beds or bars in the river below low water mark, that boundary to be fixed by its position on the first day of August in the year of the date of the lease. The lessee shall have one dredger in operation two years from the date of the lease, and one dredger for each 5 miles, within six years from such date. Rental \$100 per mile for first year and \$10 per mile for each subsequent year. Royalty same as placer mining. Placer: Creek, gulch, river and hill claims shall not exceed 250 feet in length, measured on the base line or general direction of the creek or gulch, the width being 1000 to 2000 feet. All other placer claims shall be 200 feet square. Claims are marked by two legal posts, one at each end, bearing notices. Entry must be obtained within ten days, if the claim is within 10 miles of mining recorder's office. One additional day allowed for each 10 miles or fraction. The person or company staking a claim must hold a free miner's certificate. The discoverer of a new mine is entitled to a claim 1000 feet in length, and if the party consists of two, 1500 feet altogether, on the output of which no royalty shall be charged, the rest of the party ordinary claims only. Entry fee \$10. Royalty at the rate of 2½% on the value of the gold shipped from the Yukon Territory, to be paid to the comptroller. No free miner shall receive a grant of more than one mining claim on each separate river, creek or gulch, but the same miner may hold any number of claims by purchase, and free miners may work their claims in partnership by filing notice and paying fee of \$2. A claim may be abandoned, and another obtained on the same creek, gulch or river, by giving notice and paying a fee. Work must be done on a claim each year to the value of at least \$200. A certificate that work has been done must be obtained each year; if not, the claim shall be deemed to be abandoned and open to occupation and entry by a free miner. The boundaries of a claim may be defined absolutely by having a survey made and publishing notices in the Yukon Official Gazette. Hydraulic: Locations suitable for hydraulic mining, having a frontage of from 1 to 5 miles, and a width of 1 mile or more, may be leased for twenty years, provided the ground has been prospected by the applicant or his agent, is found to be unsuitable for placer mining, and does not include within its boundaries any mining claims already granted. A rental of \$150 for each mile of frontage and a royalty at the rate of 2½% on the value of the gold shipped from the Territory are charged. Operations must be commenced within one year from the date of the lease, and not less than \$5000 must be expended annually. The lease excludes all base metals, quartz and coal, and provides for the withdrawal of unoperated land for agricultural or building purposes. Petroleum: All unappropriated Dominion lands in Manitoba, the Northwest Territories and within the Yukon Territory are open to prospecting for petroleum, and the minister may reserve for an individual or a company having machinery on the land to be prospected an area of 640 acres. Should the prospector discover oil in paying quantities, and satisfactorily establish such discovery, an area not exceeding 640 acres, including the oil well and such other land as may be determined, will be sold to the discoverer at the rate of \$1 an acre, subject to royalty at such rate as may be specified by order in council.



## MEXICO.

## Chihuahua.

The approximate production, in tons, of Parral for January was: Shipped to smelters, 13,006; locally treated, 15,437; held for future delivery, 24,214; total, 52,675.

The Calera M. Co. has a concession for the construction of a branch railroad line to handle ore and supplies between San Isidro and the Calera hill in the Guerrero district. The work of construction must begin during the month of February, and the Calera Company, or a subsidiary company organized by it, will have the privilege of operating the railroad for a period of forty years. In consideration of the amount of money to be expended on the work and of directly beneficial character for the State, the Legislature of Chihuahua has exempted the capital invested from all sorts of State taxes or contributions for fifteen years.

The Compania Minera Palmilla has put in three electric pumps at the Palmilla mine at Parral to drain the mine and irrigate the valley below. Additional men have been put at work. P. Alvarado is owner and manager.

New concentrating tables have been placed at the mill of the Pittsburgh-San Jose Reduction & Railroad Co. at San Jose del Sitio, via Gabilan. The 17-mile railroad from the mill to Vallecitos is almost completed. M. B. Place is manager.

The Chihuahua Enterprise reports that G. Wichtrich of Chihuahua has bonded the Caracalia mine, 7 miles southeast of the Placer de Santo Domingo, to W. V. Petit of Parral.—The Coahuila M. & S. Co. has taken options on the Sierra Rica silver mine in the eastern part of Chihuahua, and the Canares copper mine, both belonging to the estate of E. Miller. The latter property is near the Placer de Santo Domingo. This same concern recently took two copper properties near Cuchillo Parado in the same section. Work is already started on these, and on the Sierra Rica and Canares work is to be commenced at once. A. Bange, mining engineer of the company, is in eastern Chihuahua examining some property with a view to its purchase. The Coahuila Co. has its Mexican headquarters at Viesca, Coahuila. It is operating successfully and extensively mines in that State, Zacatecas and Durango, and is one of the heaviest producers of ores in northern Mexico. W. A. Parker of St. Louis is secretary and manager.—The approximate production of Parral for January was as follows: Shipped to smelters, 13,006 tons; locally tested, 15,437 tons; held for future delivery, 24,214 tons; total, 52,675 tons.

The January output of bullion from the Ocampo district was as follows: Conchena, 12 bars, \$24,000; Sahuayacan M. Co., 2 bars, \$13,000; Cia. B. Sahuayacan, 1 bar, \$4,000; Belen, 8 bars, \$32,000; Siqueiros, 4 bars, \$6,000; Waterson, 6 bars, \$12,000; Pinos Altos, 1 bar, \$500.—J. D. Knotts, who is mining near Guadalupe y Calvo in the southwestern part of Chihuahua, says that Senator Clark of Montana has an option on the Rosario mine in Guadalupe y Calvo at \$150,000 in gold, and has J. A. Peacock in charge pumping out the mine for examination. J. D. Knotts is president and general manager of the Isis G. M. Co. in the Santa Ramona district, 25 miles east of Guadalupe y Calvo. He has a 5-stamp mill and all machinery, including a cyanide plant, which are to be placed on the property. A depth of 150 feet has been reached. The ores average above \$20 in gold value in gold and silver. The process is to be plate amalgamation, with cyanide for the tailings.

W. C. Greene of Cananea has purchased the Santa Juliana gold-silver mine in the Ocampo or Jesus Maria district, and the water power of the falls of Basiachic, for \$438,000 gold. Greene bought the Belvanera M. Co., in which J. C. Beatty of New York is interested.

## Coahuila.

The Cia. Metalurgica de Torreon, owner of the Torreon smelter, reports the yearly profits for 1904 as \$629,279.50. The total tonnage smelted was 201,612 tons of ore and fluxes. Two more furnaces were added to the plant, and now the Torreon smelter has in constant operation eight furnaces. The Torreon Co. owns and controls 130,000 tons of lead ore, blocked out in the Cabrillas mine, near Saltillo, on the National Railroad; San Diego mine, in Santa Barbara, Chihuahua; Las Adargas, near Jimenez, and also in the Voladora mine, Aztec and Carbonato properties adjoining Voladora. Authority has been given to install three copper furnaces in Torreon and a hessomerizing copper plant. The company will proceed at once to erect the building for the new addition. E. Madero is president, C. Gonzales vice-president, L. P. de la Pena secretary and L. P. T. Saldana treasurer.

## Durango.

On February 1 the Guggenheims closed down the mines of its Velardena M. Co. at Velardena to build the new 1000-ton smelter, which will be completed this year. About 2000 men were let out and they are scattering out to other camps in search of employment.

## Guanajuato.

T. H. Leggett of South Africa has been in Guanajuato examining mining properties. He speaks well of the Guanajuato Con. M. Co., operating the Serena mine in the south end of the Veta Madre of the Guanajuato camp. Ore running 600 grams silver and 3 to 4 grams gold is being encountered in a 3-foot pay streak of sulphide of silver, in the workings 200 feet below the old workings and 700 feet below the old tunnel level. In the old workings above the tunnel level a parallel vein of good ore has been encountered in the foot wall. The company's plant consists of a 60-stamp mill, concentrators and pans, but the last are being taken out and the cyanide process is being substituted. The cyanide plant will have a capacity of 150 tons daily. F. G. Corning is consulting engineer. M. E. McDonald is manager.—The El Cubo M. & M. Co. is working the Villapando, Santa Cruz, La Loca and Capolin mines, 5 miles from the city of Guanajuato. It has a concentrating plant of fifty tons daily capacity. The tailings are treated by the cyanide process.

## Guerrero.

E. E. Noon, superintendent of G. Mitchell's La Dicha mines, says the survey of the railroad from San Marquez Bay, 12 miles south of Acapulco, has been completed to

the mines, a distance of 138 kilometers. He says work is to be pushed thereon as rapidly as possible, and that as soon as it is completed a 1000-ton plant will be built at tide water. At Acapulco the company has machinery and materials on hand for a 200-ton smelter, which is being transported to the mines, where it will be put up. This is to be completed in four months. The development work on the mines is progressing.

## Jalisco.

G. E. Purnell, president of the Guadalajara Banking Co., is preparing to reopen and work the Boca Ancha mine, in Parnaso camp. The mine is equipped with boiler, pump and hoist, and plans and specifications are being made for the erection of a reduction plant.—The Compania Minera Asturiana, composed of Guadalajara and Etzatlan capitalists, is unwatering and reopening the Camichi mine in Etzatlan.

## Sonora.

The Morelos D. Co. will put a crushing mill on the Santa Rosa at Morelos in the Moctezuma district, 75 miles south of Douglas, Ariz. B. Brown has charge at the mine.

The Quintera M. Co., operating at Quintera, 6 leagues from Alamos, has a copper furnace en route to its properties. The ores have changed so as to require this change to supplement the present concentration and lead smelting process.—A. Yaeger, representing W. S. Craz of Nogales, and associates of California, is closing a deal for the purchase of the Minas Nuevas mines, near Quintera. The mines belong to A. Goycoolea.

The Roy mine in the Pilares de Teras section of the Moctezuma district is to have a lixiviation plant, but its capacity is not decided upon. The present plant is of 10 tons capacity. Work is going on on the property with good results. A good amount of high-grade ore has been shipped to El Paso during the past year. H. Smith is superintendent.

## SOUTH AFRICA.

## Rhodesia.

The total gold output of Rhodesia for December amounted to 28,100 ounces Mashonaland: 19,847 tons, 6623 ounces; tailings, 8080 tons, 1408 ounces Matabeleland: 50,327 tons, 17,031 ounces; tailings, 19,464 tons, 3038 ounces. The mineral returns for 1904 were:

	Gold, Ounces.	Silver, Ounces.	Lead, Tons.	Coal, Tons.
January.....	19,359	3,521	34.66	5,299
February.....	18,973	3,451	29.10	2,511
March.....	17,756	5,453	33.60	5,527
April.....	17,802	4,275	32.18	5,420
May.....	19,424	4,062	35.12	3,788
June.....	20,402	5,225	33.93	5,416
July.....	24,339	5,700	37.80	5,864
August.....	24,669	6,276	40.32	4,483
September.....	26,029	6,325	35.35	5,298
October.....	24,919	7,567	41.76	4,978
November.....	26,183	8,923	57.40	5,457
December.....	28,100	7,351	43.00	5,646
Totals.....	267,737	67,759	443.70	59,778

## Transvaal.

According to the Mining Journal, November, 1904, gold returns were: Number of mines making returns: Rand, 59 (5185 stamps); Heidelberg, 1 (50 stamps); Barberton, 5 (140 stamps); Klerksdorp 1 (— stamps); Lydenburg, 2 (75 stamps); total 68 (5465 stamps):

	Ounces Fine.	Value.
Mill.....	203,570	£ 864,717
Concentrates.....	17,488	74,284
Sands.....	87,228	370,517
Slimes.....	15,524	65,941
Banks, etc.....	201	852
Rand totals.....	324,011	£1,376,311
Outside totals.....	12,156	51,636
Transvaal total.....	336,167	£1,427,947

## SOUTH AMERICA.

## Colombia.

The United States consular agent at Quibido reports that the Choco gold output is mostly from small placers worked by negroes, who are very proficient in diving to the river bottom when the occasional droughts enable them to reach the pay streak and fill their bateas with gold and platinum-bearing gravel. Modern gold dredgers are being arranged for. In quartz mining, the Davaiba mine has been fitted up with five small wooden steel-shod stamps. This mine is on the cordillera between the headwaters of the Andagueda and Atrate rivers.

## Obituary.

J. H. NEUBAUMER of Springfield, Tuolumne county, Cal., was killed by a cave at his mine near Tuttleton February 5th.

M. D. GREVE of Cripple Creek, Colo., was killed February 8th by falling 25 feet from a bucket in the Rebecca shaft, death probably being due to heart failure.

J. B. BROOKS, a pioneer in the mining industry of Colorado, died at Aspen, Colo., February 7th, aged 77 years. He is said to have smelted the first ore in the first Pitkin county smelter, erected by himself.

## Books Received.

"The Twenty-fifth Annual Report of the Director of the U. S. Geological Survey" is a 400-page volume detailing the work of the Survey for the year ending Jan. 30, 1904. In the description of the geological work done it gives a brief account of the results obtained as shown in bulletins and papers, containing some interesting information regarding mining in Alaska. The magnitude of the topographic work in this country is presented in detail—\$1,087,819 being spent for various purposes during the year.

## Personal.

J. BRESNAHAN has charge of the Kootenay Belle mine at Salmo, B. C.

S. L. BROWN of Los Angeles, Cal., is at Indian Gulch, Mariposa county, Cal.

G. G. GILLET is manager of the Quebridillas mine at Parral, Chihuahua, Mexico.

F. B. WHITMORE has been appointed superintendent of the Columbus M. Co.'s mill at Alta, Utah.

J. VERT of Pendleton has been appointed receiver of the Golconda Con. M. Co., near Bourne, Or.

J. W. BENNIE, general manager of the Shannon C. Co., Clifton, Ariz., has been visiting in Utah.

W. W. KIRBY has returned to Colorado Springs, Colo., from a three months' stay at Goldfield, Nev.

J. D. WHITNEY is superintendent and owner of the New York mine, near Greenville, Plumas county, Cal.

G. RILEY of Idaho Springs, Colo., is superintendent of the Brazil mine, near Lamartine, Clear Creek county, Colo.

D. H. BRIEN is manager of the Tamarack & Chesapeake mine in the Nine Mile district, near Wallace, Idaho.

P. H. BATES has retired as manager of the Pacific Mines of Portland, Or., being succeeded by W. B. D. Dodson.

P. MASON is superintendent of the Golden Scepter gravel mine near Bunker Hill, near Downieville, Sierra county, Cal.

THOS. MANSFIELD of Eureka, Utah, has succeeded C. L. Amsden as superintendent of the Blackbird mine at Frisco, Utah.

R. B. HULCHINSON is manager of the Conchena mines, 80 miles west of Minaca, in the district of Rayon, Chihuahua, Mexico.

M. M. JOHNSON of Salt Lake City, Utah, has been examining the mines of the Montreal & Boston C. Co. at Greenwood, B. C.

W. N. WILBUR, of Hawkinsville, Siskiyou county, Cal., has gone to San Jose Costa Rica, Central America, to engage in mining.

J. B. FLEMING, superintendent of the White Pine C. Co. at Ely, Nev., is studying ore reduction methods at Butte and Anaconda, Mont.

E. C. KNOX has been elected secretary and treasurer of the Montana-Tonopah M. Co. at Tonopah, Nev., succeeding R. P. Dunlap, resigned.

L. S. OVITT, secretary of the Turnagain Arm Co., has been visiting the California, Cracker-Oregon and Cracker Jack groups, near Sumpter, Or.

CARL R. DAVIS, late superintendent of the Center Star and War Eagle mines, Rossland, B. C., is in San Francisco, Cal., en route to South Africa.

T. H. LEGGETT of South Africa and W. M. Brodie of Chihuahua have been visiting the properties of the El Cubo M. & M. Co. in Guanajuato, Mexico.

WM. O'BRIEN has been appointed manager of the Moyer mine at Leadville, Colo., to take the place of J. F. Walsh, who has resigned as superintendent.

J. P. COLPH has been made mine boss at the Gold Reef mine at Giltedge, Fergus county, Montana, taking the place of R. Trumbull, who has gone to California.

J. H. MCBRIDE has been at the La Sal copper mine, 20 miles from Norwood, San Miguel county, Colo., owned by the Copper Glance M. Co., of which he is manager.

M. M. HOWE, superintendent of the Senator tunnel, near Breckenridge, Colo., has been called to Boston by the company to consult about further development work.

R. H. STEWART has been appointed superintendent of the Center Star and the War Eagle mines at Rossland, B. C., and M. E. Purcell has been made assistant superintendent.

A. H. BROWN has resigned as mining engineer of the Consolidated Mercur at Bingham, Utah, to accept a position with the Kitty Burton M. Co., near Salmon City, Idaho.

L. HUMPHREYS has returned from a two years' trip into Central America in behalf of the Venture Co. and the Guggenheim Exploration Co., and examining property at Kennedy, Nev.

C. A. WIEN, who has been in charge of the San Juan mine of the Southern M. & D. Co., in Santa Eulalia, Chihuahua, Mexico, has gone to Dragoon Summit, Arizona, to take charge of another property of the same company.

G. E. SCARFE of Nevada City, Cal., has been named as manager of the South Yuba Water Co.'s Nevada division in place of W. F. Englebright, resigned. W. E. Meserve has been appointed foreman under Mr. Scarfe of the lakes, flumes and ditches in Nevada county. R. E. Linder of You Bet has been made foreman for the Placer county division, with headquarters at Towle. W. R. Artbur of Auburn has been appointed manager for Placer county.

## Trade Treatises.

General Catalogue No. 15 of the C. O. Bartlett & Snow Co. of Cleveland, Ohio, is an illustrated description of elevating, conveying, mining and milling machinery sold by this company. It contains suggestions valuable to those interested in the economical handling of material.



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## Nevada and Her Resources.

Carson City is the county seat of Ormsby county and the State capital of Nevada. In the early history of Nevada the site of Carson City was not unlike the surrounding country—a sagebrush-covered valley. With the coming of the miners, Carson City came into existence, and by means of irrigation the Carson valley has become wonderfully fertile. Although the agricultural and stock-raising industries of Nevada are, in the aggregate, large, and represent a financial investment of millions, it is the mineral resources of the State which have brought it fame. For forty-five years, since the discovery of the Comstock Lode at Virginia City, Nevada has been the field of active mining development. Within the State are many noted mining districts and towns, some of them now only a memory, others comparatively idle, but for which better days are undoubtedly in store, and still others active and growing daily, with a promise of rivalling the most noted of the past. Among the old and famous districts which produced millions, and whose fame attracted the restless thousands, are Virginia City, Eureka, Tuscarora, Pioche, Austin and White Pine. Besides these, there were a score of lesser camps, such as Tybo, Silver Peak, Pahranaagat, Reveille, Hiko, El Dorado Canyon and many others. In more recent times the new districts of Tonopah and Goldfield are attracting the same amount and kind of attention as that which the others mentioned received in earlier days; but, without doubt, the social conditions now are better than they were forty years ago. The courts now settle the disputes which in former times were sometimes settled "out of court" in a most prompt and positive manner. Lawlessness is not a characteristic feature of Nevada's newer life. The State organization is as perfect as that of any other State, and the character of State institutions is as good as those found in older and more staid com-

munities where the populace is not periodically prone to get out in the middle of the night and start on a journey of several hundred miles with pack animals to join a new rush to the latest gold discovery. However unstable this sort of thing may appear to the outsider, it shows clearly the kind of material of which the average Nevada citizen is made. He is energetic, equal to almost any emergency and he has built and abandoned cities while others in different States slept on peacefully and contentedly.

The accompanying engraving is that of Carson City, taken from "Greater Nevada," and shows the beauty of the situation. The streets are lined with trees, handsome lawns surround the residences and the public buildings are of beautiful architectural design and substantially built. Many of the successful mining men of the State make Carson City their home, and the city is growing in prosperity and numbers annually.

The mineral resources of the State are still largely

undeveloped, owing to lack of economical transportation facilities. There are mines in almost every mountain range and valuable saline and other deposits in nearly every valley of the State. These, in time, will add to Nevada's wealth and greatness, for it is not gold and silver alone that are found in Nevada. There are great lead and zinc deposits, and copper prospects are abundant in numerous places. One of the greatest copper mines of the West is now being developed near Ely, in White Pine county. There are large copper veins in Esmeralda county and unknown gold and silver mines in every county in the State. Many of these are not available to-day by reason of existing conditions, but these conditions must change. With government assistance, irrigation will render larger tracts of the fertile valleys productive. Electricity will do much for the development of the mines, and railways must solve the transportation problem, which has been the chief drawback to the development of Nevada's resources.



Carson City, the Capital of Nevada.



The Wildman Mine, Sutter Creek, Cal. (See Page 116.)



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THE principal reasons for the success of the American engineer lies in his versatility, his initiative and ability to adapt himself to a novel situation. He endeavors to be accurate and painstaking, but is flexible and will quickly drop a cherished idea if he discovers the idea is at fault and that something else answers the purpose better. He shuns "rule of thumb" and usually has a good reason for adopting a plan or method, and does not follow it because his father, or some noted engineer of a decade ago, employed it. Any opposition to scientific research and the application of scientific methods is rapidly disappearing, for it is found in most branches of industry that science is a synonym of profit, and traditional methods are no longer to be trusted to give the best results.

THE recent decision of the Federal Court at St. Louis, Mo., that the Stratton estate cannot be held for damages by the Venture Corporation of London, under the plea that the mine had been salted, again clearly places the responsibility on the buyers, in the event of mining sales. The Stratton's Independence mine was carefully examined and found to be a very valuable property. If the promoters overstated the value of the property the original owners cannot be held responsible. This case has almost a parallel in the Seven Stars case of Arizona, in which promoters claimed much more for the mine than could be demonstrated at the time by examination. In this case, also, the Federal Court held that the original owners were not responsible for the misrepresentations of the promoters.

STEEL is being employed more and more in mining work and construction. It is only a few years since the first steel head frame was erected over a Western mine. Some mine superintendents looked upon the steel frame as an element of great danger—likely at any time to be demolished by a flash of lightning, but, although steel head frames are now becoming common, no such catastrophe as at first feared has been reported. Steel is entering still

more into underground work where it can be employed advantageously. Concrete also finds a constantly increasing application about mines in surface construction, and there is a drift of sentiment toward more substantial and permanent improvement in the character of surface works than was noticeable even a decade ago. These signs point to an increasing faith in the permanency of the mining industry, which is becoming to be recognized as the real basis of our national prosperity. Twenty-five years ago it was thought that if the surface plant of a gold mine would endure five or six years that was as much as could be expected of it. Plants erected under similar conditions to-day are likely to last twenty or thirty years, if not longer, under proper care, for in the constructive feature the makeshift has given place to the substantial and enduring.

## Equipment and Longevity of Mines.

There are those who question the advisability and good business policy of operating a mine to its fullest possible extent. This is a question for careful consideration. A mine may easily be overequipped, if this expression may be used, if its resources are limited, or known within a reasonable approximation, as is sometimes the case where there are no extralateral rights, and the amount of material and value per ton of the mineral deposit below is known.

Development of a mine may be carried to such an extent as to make it possible to extract all of the available mineral in a few months, but it may be that the cost of plant to handle and treat successfully this large output would be so great that no net profit would result from the operation. A mine may develop a million tons of ore worth \$10 per ton, representing a gross value of \$10,000,000, and, under ordinary working conditions with plant worth \$1,000,000, pay a net profit of, say, \$4,000,000 by working 500 tons daily; but if the plant be increased at the expense of \$4,000,000 more, so that 2000 tons may be worked per day, the additional cost of plant would be at the expense of net profit, which would then be about \$2,000,000 instead of \$4,000,000, presuming that the cost per ton is somewhat lessened. To this should be added the increased interest on the more rapid production, but this is offset to some extent by increased interest on investment, and it is clearly evident that when the mine is exhausted the \$3,000,000 plant is worth little more than it will bring for old junk, unless the owners have another mine where the machinery, if in good condition, may be again used. The argument is sometimes made that "it is contrary to the best business policy to exhaust too rapidly the resources of a mine, or of a district, besides which something is due to those who make their homes about the mine and engage in commercial enterprises." This latter sentiment is, however, seldom given commercial consideration. Mining is carried on mainly in the interest of those whose capital is invested. The ethical idea that those who take up their residence about a mine, either being employed, or in business there, because of the existence and operation of the mine, are to be thought of in connection with economy of the mine's operation meets with small favor from those who are financing the operation. There is nevertheless the possibility that a mine may be too elaborately equipped and too vigorously worked to secure the greatest net result to the owners, as indicated above. The nature of some ore bodies is such that rapid extraction is essential to the greatest economy. Some of the bonanzas of the Comstock Lode, at Virginia City, Nevada, were of this kind—a mass of friable, crumbling ore which had to be extracted quickly to secure the best results.

Mines operated under the patronage of a Government are usually worked in a leisurely manner, as compared with private enterprises, but no one claims that the greatest profit results from these operations. It seems rather to be a paternal policy of the Government to give long life to the mine, and to extract all of the minerals contained in the ore which are of economic importance, regardless of the profit or loss proposition. This is not the policy of corporations and private companies, nor can it ever be, so long as mining is carried on with a view to securing the greatest possible profit in the shortest possible time.

## Adoption of a New Process.

When new metallurgical processes are to be introduced on a commercial scale, it is important that all the details be worked out by the inventor prior to making an expensive installation; but this, unfortunately, is not always done. In such event the company's plant becomes a school for experiment, not only for the perfection of the chemistry of the process, but also for evolution of a satisfactory and economical mechanical means to apply it. Often the estimated expense runs far in excess of the amount believed to be sufficient, and for this reason ample funds should be available, or all that has been done may be lost. Sometimes it occurs that after a plant has been installed its defects are realized, and it is seen that had a different course been pursued success might have resulted; but the funds are exhausted and the process is condemned, when a more fortunate application of the ideas might have brought success. It sometimes pays better to defer the construction of a plant until the fullest investigation proves that the proposed change can be made to advantage. In some instances the chemistry of a new process has been fully settled, but the details of the mechanical portion of the process have not been given sufficient consideration. The engineer engaged to review the proposed installation fails to discover this important fact until too late. The several devices are found to be crude and fail to properly perform the functions which they were expected to perform. Such experience stands as an example of the need of care in installing innovations which have not been worked out to a successful conclusion. Innovations are not to be discouraged, for metallurgical science as it exists to-day has been built up on innovations and upon the ruins of disappointed hopes. If no innovations are attempted progress would be slow and science would come to a standstill. What is required is careful, painstaking investigation and the proof that any proposed change can be made to advantage, and that the new invention—whether machine or process—will do what is claimed for it.

AMONG the first educational institutions of the country to take up the important matter of secondary technical education is the Colorado School of Mines at Golden in that State. At a recent meeting of the board of trustees of that college, it was decided to adopt a scheme which shall be operated in connection with, but independent of, the under-graduate and post-graduate courses of study for the benefit of miners. The course shall not exceed one year in length, and is intended especially for miners, mill foremen and metallurgical assistants, and shall be open to bona fide residents of Colorado, who are between the ages of 16 and 35 years. The requirements are chiefly the possession of an English common school education in the fundamental branches. The need of a higher and more comprehensive education among the assistants to the technically educated superintendents of the various branches of mining and metallurgy has long since been realized, and it is with a view to meeting this demand that the innovation here mentioned is to be made in the Colorado School of Mines. Ordinarily the miner and millman gains his knowledge through years of practical experience, but the need of hastening the acquisition of this necessary knowledge has led to the adoption of this very sensible plan. It is not claimed or thought that the student will, at the end of his course of one year, have learned all that can be learned, but, with a view to specialization, it is believed that he can acquire much of value to him and to his employer along the special lines which he shall elect to study. There has been a tendency in this direction for some years past, which has found application in the various correspondence schools. This newer idea brings the student into personal contact with his instructors and it will without doubt be well patronized by the men whom it is intended to benefit.

A NEW phase in industrial troubles in New South Wales, Australia, is reported by recent press dispatches. A number of miners and trammers struck in the coal mining district of Newcastle. They were arrested and formally charged with unlawfully refusing to work. Some of the trammers returned to work at a 10% reduction in wages.



## CONCENTRATES.

THE conveyance of a mining claim containing the apex of a vein conveys also the extralateral right.

THE function of the tightening pulley is to maintain an equal tension on the belt, and it also obviates the necessity of frequently taking up the slack as the belt stretches.

THE direction of a rope drive may be changed by interposing a pulley or sheave at the point of divergence, but usually the shafts of the principal pulleys of a rope drive are parallel and the pulleys are in the same plane.

A MILLSITE may be located by a citizen of the United States on the non-mineral public lands, but it is not necessary that such millsite locator have also a mining location in connection with the millsite. A site may thus be taken for the location of a custom mill or smelter.

WHERE the dump is settling rapidly at the front and there is danger of the car getting beyond the control of the trammer, accidents may be prevented by providing a rope supplied with a hook at one end. The rope is tied to a sleeper beneath the track and the hook made fast in the wheel frame of the car. It may then be dumped without danger of going over the dump.

THE mining laws of Arizona, passed in 1891, require that within ninety days from the date of making a mining location the locator shall sink a discovery shaft in the claim to the depth of at least 10 feet, or deeper, if necessary, until mineral in place shall have been exposed. The California law has no such requirement. In Montana a shaft 10 feet deep must be sunk within sixty days of the date of making location.

FEED WATER HEATERS are of various design and cost. The simplest are those which utilize the heat of the exhaust steam in heating water before it is pumped into the boiler. It is done by passing the exhaust through a chamber containing the water. A well-constructed heater of this type will bring feed water to 200° F., which effects a large saving of fuel. Such a heater can be made at small cost and soon pays for itself.

WHEN application has been made for a patent to a mining claim, the applicant must continue to perform the annual assessment work according to law until after the period of publication. If, pending the patent proceeding, the applicant fails to perform his annual labor, the ground becomes subject to relocation by others; but after the period of publication has elapsed, such relocater can not inject himself into the patent proceedings.

A MINING claim located in California, at any time during 1904, requires no assessment work during that year, as there is no local law requiring a stated amount of work as a part of the act of location (which some of the States require), and a claim located in 1904 is not subject to relocation January 1, 1905, nor until December 31, 1905, and not even then if the work of assessment has been begun and is actually in progress for the year 1905.

A CONVENIENT way to heat water for the change room is by placing a series of return pipes in the furnace or stove which heats the dry room and connecting these pipes with a tank of water in the upper part of the building. The water in the pipes within the stove is heated and rises to the tank above, cold water taking its place. A pipe may be taken from near the bottom of the tank and carried along the line of washing sinks for use of the men.

A NUMBER of small steel tools or other pieces of steel may be given a uniform temper by placing them in bone ash in a receptacle of proper construction and heating them in a furnace supplied with petroleum blast. All are given the same degree of heat and all are removed at the same moment, and may be tempered in the same manner. The only thing to guard against is the difference which may arise from the possible varying size of the several pieces.

IT is economy to lay the track as close to the face of the drift as possible. After clearing up, the track should be placed in position and a floor of lagging or plank laid for the broken rock from the next round to fall upon. Lagging is sometimes broken by the blasting, but on the average, much time is saved by providing this floor. Short pieces of track should be provided and when advance enough is made a full-length rail may be substituted for the short sections.

THE "mustard" or clay-like gold found in some of the mines of the Coolgardie district of Western Australia has been found to be metallic gold of a sponge-like character, composed of innumerable microscopic globules, threads and filigree, cemented together. It is dull and lusterless when taken from the mine, but if a knife blade be passed over it the metallic luster is at once evident. A similar occurrence of gold has been noted on Bullcreek, in Mariposa county, Cal., where good sized nuggets, which would weigh \$6 to \$12 if of gold of the ordinary kind, are found to contain but \$2 or \$3 owing to their peculiar cellular

structure. It is thought that this is due to the removal of some mineral formerly intimately associated with the gold, probably tellurium. At one time it was thought that these occurrences presented allotropic forms of gold, but the former theory is the more tenable.

THERE are machines made for bending rails, which operate with a heavy thread, like a jack. They are easily portable and may be taken underground. Track rails are usually adjusted by spiking one end and prying the rail over with a bar to the point required and spiking it there. The machine mentioned is useful for bending heavy rails—35 pounds per yard and heavier. Underground rails should be at least 12 pounds per yard for ordinary use, though if the mine be dry so that ties will stay where placed, 8-pound rails may be used if the cars are not too large. On the surface it is advisable to use 16-pound rails.

QUICKSAND has been solidified sufficiently for the purpose of excavation by injecting cement into the mass. It is done by driving pipes into the quicksand from 4 to 8 feet apart, and then by connecting a pump with alternate pipes and pumping water into the pipes under pressure, which establishes a circulation between the water pipes and those left open, as sand is displaced by pumping, cement grout is pumped in to take the place of the sand. When the grout appears in the open pipes the latter are capped and the water pressure is continued, forcing the cement into the surrounding sand. It is then left to set. The pipes are then raised a few inches and the process repeated. It is said to work better in coarse sand and gravel than in fine quicksand. In the latter the freezing process is said to work more satisfactorily.

WHERE convenient to place them, well constructed switches are superior to turntables, such as are ordinarily built underground. A good turntable is all right, but in the desire to economize they are often poorly constructed, and require the services of two men to turn a loaded car on them. A turn sheet is better than a poor turntable. Poorly built switches are no better than a poor turntable. The time lost in replacing a loaded car which has jumped a poorly built switch would have built a good one. Switches should be so made that they may be quickly adjusted, and easy of access for repairing and to free them from muck. The pin, which holds the movable pointed rail, should be strong and set in a solid plate, but not upset below the plate, for it should be so arranged as to be quickly taken up if necessary.

It is presumed that the owner of a mine will keep the mine clear of water in his own interest, but he is under no obligation to do so. The work of development and mining must be done in such a manner as to cause no damage to adjoining property, but if at any time the closing down of his mine, or a portion of it, permits water to rise and flow into an adjacent mine the owner of the idle mine cannot be held responsible for any damage or increase in water from this cause. The owner of a mine, for the purpose of protecting himself from an inflow of water, may erect a dam or other structure on his property for the purpose of restraining or diverting the water, subject to the limitation that such dam, bulkhead, or other structure, has no effect which will be detrimental to the property of the adjacent owner, and which damage would not have occurred were it not for the dam.

BLEACHING POWDER is also commonly known as chloride of lime. It is soluble in about 20 parts of water. When brought into contact with sulphuric or hydrochloric acid it gives up its chlorine. With the sulphuric acid, the sulphur unites with the lime to form calcium sulphate, leaving the chlorine free. It is used in the barrel chlorination process. In making the charge it is customary to first charge the "bleach," as it is called, which is followed by the ore, which completely covers the bleaching powder. Then the water and acid are introduced, the barrel quickly closed and the cover secured. The barrel is then retorted, which results in a thorough admixture of the several ingredients of the charge. The chlorine is liberated, as above indicated, and attacks the gold present in the ore. The process was quite extensively employed some years since at Deadwood, S. D., in the treatment of the telluride gold ores of that district, but has since been superseded by the less expensive cyanide process. There are ores, however, which may be successfully treated by the barrel chlorination process which are not readily amenable to cyanide treatment.

ORES being roasted prior to pan-amalgamation require a less careful roast than those which are to be leached or amalgamated in wooden barrels. The grinding of the muller in the iron pan and the chemical reactions taking place overcome to a certain extent the defects of incomplete roasting, but it is always advisable to roast the ore carefully. It is not customary to add salt in roasting ores containing an appreciable quantity of gold when the roasting is done in an open furnace like a reverberatory. A reliable method of determining the loss of gold and silver in the roasting of large amounts of ore, is to dry, weigh, sample and roast a quantity, from one to ten tons. After cooling, weigh and sample again. It may weigh more or less than before roasting, depending on the original character of the ore, the amount of salt used, etc., and the manner in which the roasting was

done. The assay of the unroasted ore, with reference to its total weight, will give the value of the ore before roasting, and the same method on ore after roasting will give the value after roasting, and the difference will represent the losses by volatilization and dusting. To make this test dependable the furnace must be thoroughly cleaned, both before and after the roasting. With a furnace of proper construction a portion of these losses may be recovered in the dust chamber.

NATIVE ARSENIC occurs sparingly, but the compounds of arsenic with base metals and with silver are numerous. The most common of the arsenical compounds found in nature is mispickel, or arsenical pyrites (FeAsS), and is usually regarded as the equivalent of pyrite, in which one atom of sulphur has been replaced by one of arsenic. Arsenical ores containing gold have been successfully treated by amalgamation, followed by roasting, during which arsenic oxide passes off in white fumes, and is condensed in chambers and the subsequent treatment of the roasted ore by the bromo-cyanide process. It is not always possible to tell without experiment whether an arsenical gold ore is amenable to this process without trial. The process outlined above is that practiced at the Del Oro mines, Hamilton, Ontario, Canada, and is eminently successful there.

EVERY MINE should be provided with adequate fire protection and the workmen drilled in the use of fire apparatus, both above and below the ground. The best fire protection is afforded by distributing hydrants at numerous places easily accessible, and provided with nozzles. The pressure, where possible, should be at least 200 feet—and more is better. This permits men to fight fire at a considerable distance and dispenses with the necessity of a hose. The nozzles should form a portion of the hydrant and be so arranged as to be pointed in any direction. The whole affair may be made of 3-inch and 4-inch pipe, the nozzle being of 3-inch pipe drawn down to an orifice of the proper size, and supplied with a thread at the other. The stand pipe may be made of 4-inch pipe, having an elbow at the upper end. Into this should be screwed a short nipple, to which is attached a second elbow, and into the latter is screwed the nozzle. By making the pipe connections loosely, so as to allow of easy freedom of movement, the nozzle may be elevated or depressed, and turned either right or left, at will. The controlling valve should be a straightway gate set in the standpipe, and the apparatus should be frequently tested, to know that it is always in good working condition.

THE practice of sweating amalgamated mill plates, as carried on at a West Australia mine, is by covering the plates with gunny sacks and turning steam in between the plate and the bags. This is continued for an hour or more, when by which time the amalgam is so soft that it may be readily removed with an iron scraper. The plates are not injured by the process—on the other hand, are softened and annealed by it and rendered better for the purposes of amalgamation. If the coating of gold is thick, it peels off in good-sized scales. It is more easy to remove a thick than a thin layer of amalgam. Overheating plates by means of direct application of fire is considered injurious to the plate. After treating by sweating, as above described, the plate is wet with strong hydrochloric acid and kept covered with it for twenty-four hours. A mixture of equal parts of powdered ammonium chloride and nitre is then spread over the plate and it is then gently heated. The dressing melts and appears to work its way beneath the gold; when the heat has raised until the plate is red hot it is set aside to cool, when the gold may be stripped off into a vat or tub. Where the amalgam is thin, patches of gold will often remain. When it is no longer desired to use the plate, it may be heated red hot and sprinkled with flower of sulphur, which causes the gold to form in blisters on the surface of the plate, when they may be removed. These measures are only justified when mill work is to cease for a considerable time or permanently.

MANGANESE OXIDE (MnO<sub>2</sub>) is often found associated with ores of gold and silver, particularly the former. Noted instances are Butte, Mont., Leadville, Colo., and Tombstone, Ariz. The action of manganese dioxide on mercury is not well understood and its evil effects are often the cause of much annoyance, notably in pan mills. It is thought by many that in some manner nascent oxygen is given off from the black manganese oxide, and this in some manner affects the mercury. In pan mills caustic lime is often added with good effect, and it may be that a similar result might be obtained by adding quicklime to the mercury in a plate mill. In some mills concentration before amalgamation has been found to give better results than are obtained in the usual practice. In concentration before amalgamation much of the deleterious mineral present—usually manganese oxide, molybdenite or graphite—is washed away, and the gangue and precious metals, relieved of these substances, amalgamates more readily. In other cases concentration alone has been found to result in a saving of a higher percentage of the values than could be obtained by amalgamation alone in the presence of manganese, graphite or molybdenite. In the treatment of some silver ores by pan amalgamation process, where much base metal is present, the addition of a small amount of manganese oxide has been found to have a beneficial effect, producing a higher-grade bullion than was otherwise obtainable.



## The Mother Lode in Amador County, Cal.\*

NUMBER II—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by W. H. STORMS.

Heavy gouges, often many feet in thickness, indicate more clearly than any other physical feature the extent of these movements, which must have continued throughout a long period. Some mines show evidence of several periods of such movement. Quartz veins have been formed and subsequent pressure and movement have fractured the solid quartz into thousands of fragments of all sizes, from fine granular material to boulder-like masses, often including more or less of the black slaty material. In most instances infiltration of silica has cemented these shattered zones, reforming solid veins, which, in some places, are over 100 feet in width. Very large bodies of this description occur in the Wildman mine at Sutter Creek, and also in the Keystone mine at Amador City.

In the town of Sutter Creek and vicinity there has been much dynamic disturbance. Wherever the slaty rocks can be seen on the surface they are found contorted, folded and faulted in the most perplexing manner. This condition is also in evidence in the underground exposures of the Wildman mine. Between the 800 and 1200-foot levels, particularly, the country rock, with its included veins, has been faulted and folded in a way that renders the operation of the mine unusually difficult. In some places the normal dip has been changed from east to west. Large veins of good ore are found abruptly cut off and their continuation has never as yet been rediscovered. In one instance the unusual occurrence of two pay shoots divided by a stiff putty-like gouge 3 feet wide has been worked. This gouge also contained gold and was sent to mill. In the Kennedy mine a black clay slate gouge was mined which was rich in gold.

To complicate matters the vein splits near the north line of the Wildman, the east branch running through the Mahoney into the Belmont claim and beyond, presumably into the Mutual mine, probably forming what is there known as the Mexican vein. The west branch runs through the Mahoney into the Lincoln mine adjoining, through which it courses with a fairly uniform strike. The vein splits into several minor branches on the slope of a greenstone hill, several hundred feet north of the Lincoln shaft, and, as far as known, these branches never reunite, nor has it been possible to trace the Lincoln vein, in its individuality, beyond the south slope of this hill of massive diabase.

This is a condition which has attracted much attention locally. The Lincoln vein was one of the richest worked in this county in the early days of mining on the Lode, and to the depth of 350 feet, or thereabouts, formed a strong banded vein of high-grade gold ore, from which large profits were derived. At about the depth indicated, however, a fault striking nearly with the vein and having a somewhat flatter dip, cut off the pay shoot, and although extensive development has since been made, the downward continuation of the original vein has never been identified.

That this fault was a normal one is indicated by the fact that all of the slates and schists occurring to the eastward of the fault plane have the normal east dip, common to the region where not disturbed, while all rocks (schists and slates) to the westward of the fault have a decided dip to the west, as though the entire country had been flexed eastward and downward by the settling hanging wall rocks. The indications are that this fault is much more extensive than at first may be supposed, but, owing to the extreme irregularity of the occurrence of slates and schists, with their very numerous minor faults and folds, it is impossible to even approximately estimate the amount of the throw of the fault. The work now being done by the Wildman company through the Lincoln shaft may throw some light on the perplexing problem. It is possible that the fault in depth may have merged with some pre-existing vein fissure, but this is not known to be the case.

The Lode is found in strength to the northward of this region of disturbance, in and near the town of Amador City, in the South Spring Hill and Keystone mines, but it has been impossible to trace a direct connection between the veins of the Lincoln mine on the Sutter Creek side of the divide and those of the South Spring Hill mine on the north side. An exposure of rocks is found along the county road between Sutter Creek and Amador City, but where the black clay slates and greenstone schists are found in contact, and where the miners of this region would expect to find the vein from experience along the Lode to the northward or southward, no sign of a vein is seen other than an occasional bunch of vitrious white quartz, with which have been found occasional pockets of gold in the Talisman and Wabash claims, and also, I am informed, in the North Star mine. There is, however, no indication of gouge or a banded, regular vein—the characteristic features of the Mother Lode veins at contact.

A few hundred feet to the west and northward of this exposure occurs the great system of veins and fissures of the Keystone mine which have been developed by over 10 miles of level and shaft. The workings are about 1500 feet deep on the vein, and extend

from the South Spring Hill to the northern limit of the property. There are several nearly parallel veins in the black slates of the west country; a large brecciated vein, or lens of amphibolite schist and quartz, which, in places, is 150 feet in width, and a hanging wall fissure noted as a producer of pockets. To attempt to describe the Keystone mine in a manner which would do justice to either the mine or the person undertaking so great a task would require a good-sized volume, so it may be said briefly that it consists, as previously stated, of a series of veins of approximate parallelism in both strike and dip. The heavy gouges, the banded, massive and brecciated veins, all are here present in typical form. Southerly these veins extend into the South Spring Hill and South Keystone properties, having been extensively developed in the former, the latter having as yet only superficial workings. The strike of this series of veins through the South Keystone, if followed closely, will carry them to the westward of the Lincoln mine at Sutter Creek, unless the formation or the veins themselves swing to the eastward in their southerly course. If this occurs it is not as yet recognized as a fact, and it is not indicated by surface exposures and numerous open cuts.

It appears as though the massive greenstone hill north of the Lincoln mine has acted as a barrier, as it were, to the formation of a continuous fissure northward from the Lincoln mine, and that the stress producing the fissures, being insufficient to disrupt the massive, tough diabase, caused the fissure to split into a number of branches which died out in the hard intrusive mass of greenstone. As the disturbing forces were not local, but rather of orographic character, the stress was sufficient to produce extensive fracture and movement in the slates and along the contact of slate and greenstone, to the northward and west of the diabase hill, and in these fissures were formed the veins now developed in the several mines extending northward through the South Keystone, South Spring Hill and Keystone mines. On the North Star claim a shaft has been sunk 1000 feet deep and a vein cut in a crosscut run west from this shaft. Beyond the Keystone the fissure system extends in essentially unbroken lines, through the Bunker Hill properties, and beyond into and through the Hazzard and Fremont Consolidated properties. Great masses of quartz characterize this portion of the Lode and outcrops upward of 100 feet in width may be seen on some of the mines. In the underground workings of the Fremont Consolidated mines are similar great lenses. Each mine has characteristics peculiar to itself, and yet, on the whole, they each have features, both structural and geological, peculiar to all.

The Lode continues northward as a series of veins possessing the same characteristics as those previously described, and in the vicinity of Plymouth another great mine was developed—the Plymouth Consolidated.

There is nothing in the topography of the country to indicate the presence of rich mines as compared with those of lesser merit. Among the great mines the Consolidated Eureka at Sutter Creek, and the Keystone at Amador City, have somewhat similar surface conditions, but underground they are very different as indicated by the description of each as previously given. This similarity of surface contour has been noted by some, but it is due to erosion under similar conditions—the soft slates along the line of fissuring cutting away faster than the hard greenstones. Such topographical features are no index of value in the mines themselves. At the Kennedy, Argonaut and South Eureka, the rocks have been protected from erosion, as previously stated, by the ancient river channels which formed in the valleys crossing the Lode in Pliocene time. Recent erosion has modified this topography, and, in some instances, the valleys have become the hills, and where there was solid rock the more recent streams have carved out for themselves new canyons, and it may be safely said that in many instances the topography bears almost no relation to vein structure on the Mother Lode, and certainly none to the value of the mines.

At the Plymouth Consolidated mines the country is nearly flat. Northward from Plymouth the Lode again, apparently, has a direct influence on the topography of the country, for it has undoubtedly been responsible for the canyon of Indian creek. Beginning in a shallow, amphitheater-shaped valley at Plymouth, it gradually deepens northward until the surrounding hills rise more than 1000 feet above the stream. The western and eastern hills are of hard greenstone, while the canyon bed is largely soft clay slate and amphibolite schist. Numerous springs mark the course of the Lode along the west side of the valley, and several gold-bearing veins are known, and some development work has been done on them. The Illinois claim is on one of these, where a vein of white quartz in the creek bed prospects well. Heavy gouges, with brecciated quartz, mark the position of some of the more important fissures in this vicinity, but for some reason very little prospecting has been done for a distance of four miles between Plymouth and the Rhetta Consolidated mines. This latter has extensive development, and several veins of good gold rock have been developed in the property. After crossing into El Dorado county the Lode is undoubtedly responsible for the deep canyon which follows it for a distance of about 10 miles to the German mine,

the cause being, as previously stated, due to the easily eroded fissured clay slates between great masses of harder greenstone. In this part of the Lode, and, in fact, from the vicinity of Sutter Creek, the ancient river channels have apparently had little or no part in influencing the topography of the country, as far north, at least, as the vicinity of Placer-ville, in El Dorado county.

## Electricity for the San Juan Country of Colorado.

An important industrial enterprise to be inaugurated in the San Juan country of Colorado this year is that of the Animas Canal, Reservoir, Water, Power & Investment Co., located on the Animas river, 20 miles below Silverton, at the mouth of Cascade creek. It consists of a large plant for the generation of electrical power to be distributed to the mining districts of San Juan, Ouray, Hinsdale, San Miguel and La Plata counties, furnishing light and power to cities and mines. It is estimated to cost, when completed, \$5,000,000.

Work was begun on the construction of the power plant in June, 1903, and the initial plant will be completed by July 1 of this year, ready to deliver electric power to the Silverton district and the city of Durango. The work finished on the initial plant consists of a dam and headgates in Cascade creek,  $3\frac{1}{2}$  miles of flume 6 feet deep and 8 feet wide, a crib dam at the reservoir site 50 feet high and 700 feet long, and a foundation for the power house, 3 miles above Rockwood. Poles have been set from the power house 28 miles to Silverton and 20 miles to Durango. The wires will be strung early the coming season. The work yet to be done on the initial plant by July is the completion of the power house and the building of a 2-mile flume from reservoir to power house. The latter has all foundations of concrete, and the structural part is being built of brick and steel. The reservoir dam is of timber cribs, drift bolted together, filled with rock and made tight on the upstream side by three thicknesses of 3-inch plank. The reservoir is  $3\frac{1}{2}$  miles long and 1 mile wide at its widest point. The pipe line from the reservoir will be 34 inches in diameter at the power house and 44 inches at the intake. The fall is 997 feet. Machinery first to be installed consists of three 1000 H. P. generators, directly connected with two 4000 H. P. Pelton water wheels. Accommodations are provided for two extra generators, making 12,000 H. P. possible. Six thousand horse power will be installed within the next ninety days. The cost of the initial plant will be \$750,000. It is expected to eventually increase the capacity of the establishment to 40,000 H. P.

When the initial plant is ready for operation wires will be strung to Durango, Silverton, Telluride, Ouray, Lake City and to mines all over the San Juan country. The company guarantees to furnish electricity for all purposes required at a cost to consumers not to exceed 75% of what they have heretofore been paying.

The principal offices of the company are at Durango, with a branch office at Indianapolis, Ind. The officers of the company are Dr. H. Jameson president, T. N. Harden vice-president, P. Gray secretary, B. F. Schmid treasurer and general manager, H. T. Henderson chief engineer and general superintendent, A. H. Firey chief electrician.

## Taviche District, Mexico.

This district is about 250 miles south of the city of Mexico. Its altitude is 5000 feet and its climate mild and salubrious throughout the year. It is a region of "perpetual spring," although within the tropics, says a writer in the Mexican Investor.

The natives live in huts and houses of cane or reed, like the villages of Central Africa. They are poor, but being very good-natured, contented and cheerful, enjoy life. Wages are very low. Miners and mechanics earn about 40 cents gold per day; laborers (peons), about 25 cents a day; a good native house-keeper and cook, 80 cents per week. All native products are cheap. Turkeys, for example, are sold at the market for 20 cents gold a piece.

The mines were worked from prehistoric times by the Aztecs or Toltecs and their unknown predecessors. Despite their antiquity these mines are shallow. The older work was done by the firing method. A fire was kept burning against the face of the ore to be extracted until, for a few inches depth, the ore was cracked. Water was thrown on the hot rock to assist the cracking and so a few pounds were broken loose. With depth the heat and smoke prevented the miners from maintaining more than a single fire at a time. One can walk along the outcrops for hundreds of feet and see the walls of the vein still standing, from which the ancient miners with infinite pains and perseverance extracted the ore. The veins are from 3 to 12 feet wide. The country rock is eruptive.

More modern methods have been adopted only within the last twenty years. The district is now fairly productive. Several mines within the past five or six years have records of shipping \$4,000,000 to \$5,000,000, Mexican, worth of ore. Americans have

\* See illustration on front page.



recently purchased about a dozen producing mines and are extracting ore on a scale hitherto unknown in the district.

Little water is so far encountered. The ore hitherto has been raised by large horse whims, called "male-cates," sometimes, by attaching three or four arms, six or eight mules could be used or worked there at a time.

The Mexicans are noted ore-sorters and reduce the ore to pieces no larger than 1.5-inch diameter before rejecting it. For this work they receive the equivalent of from 12 to 24 cents United States money per day. In one mine thirty-seven days' labor was required to sort out one ton of shipping ore. The value of the crude ore averaged about \$36 gold; that of the rejected waste, \$12 gold; shipping ore, about \$180 per ton.

## The Center Star Mine, Rossland, B. C.\*

NUMBER II.

Written by L. H. COLE.

**DRILLS USED.**—Most of the drills used are of 3½-inch diameter and 6-inch stroke—Rand drills of the Little Giant type. They are set up, where possible, on columns, which can be braced to the sides of the drift or to the floor and the back. Where the use of a column is impossible a tripod is used. The air compressors are also of Rand make.

Cross bits are welded to round shanks, which vary in length from 18 inches to 10 feet. One shift of eight hours dulls about thirty bits to each machine.

A round of holes for drifting in this mine generally consists of ten holes arranged as follows:

Two back holes, three break holes, three cut holes, two lifters.

If the work is heavy a couple of holes may be added, one more lifter and one more back hole. The length of the holes varies from 5 feet to 7 feet.

The back holes are inclined at an angle of about 30° to the horizontal.

The next row of holes, called breast holes, is drilled slightly off the horizontal, just enough to hold water. They break down the portion immediately below the rock in which the back holes are placed, so as to relieve these upper holes.

Below the breast holes is another row, called cut holes, placed so as to run down at an angle of about 45°. They remove the central portion of the rock so as to allow the other holes to break well.

The two bottom holes or lifters are drilled in at an incline downwards so as to form a wedge with the cut holes. Their object is to keep the floor on a level.

The side holes in each row are inclined either to the left or to the right, according to the side they are on, in order to keep the walls at an even distance apart. Where the drift is required to turn either to left or right, all the holes are inclined in that direction.

For raises or winzes the holes are so placed that when the center cut holes are blasted a free area is left for the other holes to break into. Eighteen holes is the usual number for a round, three in each line.

An exactly similar round is used for sinking, with the exception that the center holes are inclined more towards each other so as to give more breaking power. The average length of the holes is from 6 feet to 8 feet. For shaft sinking a great many more holes are used, as the area to be broken is generally larger.

The holes for stoping are placed so that the fullest breaking power of the charge can be utilized, and are placed horizontally in rows, one above the other. The higher holes are a little shorter; all are water holes.

When possible all blasting is done at night. The hours from 1 A. M. to 7 A. M. are set apart for this, and two men do the blasting for the whole mine. By this method the mine is free from gas and smoke for the morning shift.

The 60% powder is only used to break boulders, or whenever hand drilling is used for timbering holes.

The average charge for a drift round (ten to twelve holes) is from 90 to 100 sticks, or about 45 pounds.

The shortest fuse is timed to burn six minutes, giving the men time to get to safety.

In drifts the cut holes are fired first, then the breast holes and lifters, and last of all the back holes. In raises, etc., the center holes are first fired, then the following rows in order.

Stoping holes (horizontal) are fired one row at a time. The men then charge the next row above and fire that. They continue this until the whole round is blasted. Similarly in shaft sinking, the center holes are blasted and the muck is cleaned out before the next row is fired.

**MUCKING.**—When the working place is clear of smoke the mucking of the ore begins. The muck is loosened and shoveled into small cars, which are trammed to the shaft station by men. No horses or mechanical power are used underground, with the exception of on the second level. Here a small sta-

tion hoisting engine is used, which pulls out eight cars at a time. It is impossible for this to be done by men, as there is a heavy grade in the drift by reason of the drainage being towards the mouth of the tunnel.

The rails are of 16 pounds per yard, which are spiked to ties placed 2½ feet apart. Track laying is kept well up with the work.

The curving of all rails is done underground as required.

The car used stands 2 feet 11½ inches from top to rails, and holds 16 cubic feet—approximately 1 ton.

**HOISTING.**—The main hoist in the mine has two drums, each 6 feet by 3 feet, with a capacity of 1700 feet of round steel rope of ¾ inch diameter. The average winding speed is 800 feet per minute, with a maximum of 1000 feet per minute.

The engines are 14-inch by 18-inch stroke, with reversing gear. A friction clutch is attached, permitting of either drum being run independently, so that hoisting may be carried on at the same time from different levels. The round rope is prevented from cutting the foot wall timbers by rollers placed on the wall plates at intervals.

The skip runs on a 30-pound steel rail spiked to the foot wall plates of the shaft. The shaft guides are chiefly for safety purposes, so that the safety clutches can grip them in case of accident.

The weight of the skip is 2400 pounds and of the ore 4000 pounds; total weight hoisted, without rope, 6400 pounds.

The skips baul with detaching hooks, so that in the case of an overwind the rope is detached and the skip hung in the head frame.

When a winze is being sunk a small temporary hoist is generally used and the muck, etc., is hoisted in a bucket running on skids, and is dumped automatically into cars when it reaches the level.

**TIMBERING.**—On account of the solidity of the rock, timbering is not required in ordinary drifts and cross-cuts. In stopes and raises stulls and lagging are used extensively, but when the stope becomes too wide (15 feet is about the limit) square sets are adopted. Square timbers are also used in the shaft. The timber is supplied to the mine as:

Square timber: 10x10-inch square by 16 feet long.

Planks: 3 inches and 4 inches wide by 16 feet long.

Stulls: logs varying in diameter from 10 inches to 25 inches with the bark removed and cut into lengths of about 16 feet.

Lagging: small, round timber left in the rough and in 16-foot lengths. Tamarack is generally used.

Adjacent to the framing shop, and connected with it by tracks, is a commodious timber yard. The timber is hauled along the road on the upper side of this yard, and from the wagons it is rolled down skids and piled, being brought into the framing shop on trucks. A swing saw is used for cutting the timbers to the required lengths, and the spare timbers are framed by the timber framing machine. From the framing shop the timbers are trammed to the collar of the shaft as needed. For lowering the timber into the mine the ordinary skips are generally replaced by a special timber skip.

In the shaft the sets are run at right angles to the dip, but in the square set stopes the floors are laid level. On the other hand, in the narrower stopes the stulls are placed approximately at right angles to the walls.

The timbers are firmly wedged into place by wooden wedges. On top of these is placed the lagging, so as to form a solid floor. The flooring used in the square sets is 3-inch and 4-inch planking.

**PUMPING.**—The water encountered is comparatively small in amount and is non-corrosive. Three pumps—one on the fourth level, another on the eighth level and the third in the sump—suffice to cope with all the water.

A large pump, to be run by electricity, is now being installed at the sixth level station, which will do the pumping for the whole mine.

**VENTILATION.**—The mine is provided with a blower, having a 14-inch delivery pipe. It runs about eight hours per day and supplies 150,000 cubic feet of air per hour. It is driven by a 10 H. P. induction motor. The blower is reversible and can thus be used either to force fresh air into the mine or to exhaust the foul air.

There is more or less natural ventilation up and down the shaft, due to its connection with the tunnels. When stopes or raises extend from level to level a certain amount of ventilation is secured, but when these are not completed artificial ventilation is required. Much time is saved by artificial ventilation, as the smoke and poisonous gas generated by the explosion of the powder are quickly sucked out by the reversed blower, and the working place cleared so that work can be resumed.

**LIGHTING.**—The main shaft, stations and principal tunnels are lighted with electric incandescent 32 candle power lamps. The wiring for the mine lighting is carried down the shaft in an iron conduit with iron junction boxes at each station. The wiring is so arranged that the lamps can also be used for flash signals if needed.

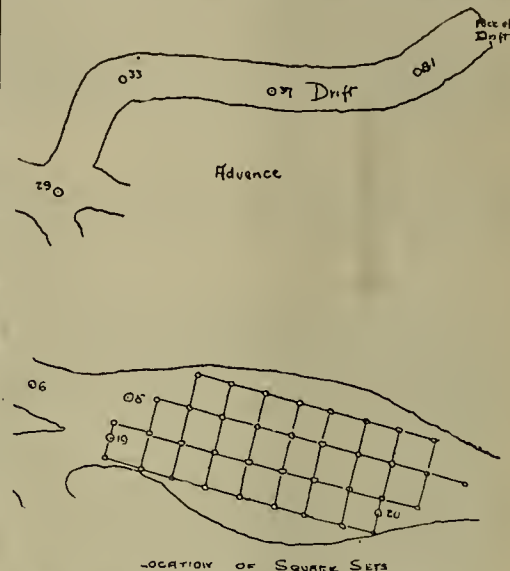
**TELEPHONES.**—There is telephonic communication between all the principal mine buildings, and also between the lower mine workings and the shaft

house. The system is so arranged that no central exchange is needed.

Electric gongs are used for station signals, but pull bells are used to signal the skips.

**SURFACE SURVEY WORK.**—Except where very accurate work is required, the location of all mine buildings is done by the stadia method. If accurate work is to be done, a transit and band tape are employed; for leveling, an ordinary level is used.

**UNDERGROUND SURVEYS.**—In underground work the transit (reading to minutes) and steel tape are used entirely. Survey stations are set at convenient intervals in the mine, which are accurately located from a line down the shaft. The methods then em-



Surveying in the Center Star Mine, Rossland, B. C.

ployed are as follows: Stations are placed in the back of the drift, etc., by drilling 2-inch holes about 4 inches deep. Into each of these holes is driven a wooden plug, level with the back. Horseshoe nails, with a pierced head, are placed in the plugs to allow of plum bobs being hung from them. A brass tag with the number of the station on it is fastened beside each nail.

The advance is surveyed twice a month. It is taken up as follows: (See diagram transit set up at station 37); vernier set 0°, B. S., on station 33; a sight is then taken on station 81 and angle read. Angles are always read twice, by doubling, as a check. The elevation of station 81 is located, by means of a button set on plumb bob at 81, on a horizontal line from the transit. The horizontal distance between 37 and 81 is measured to the nearest hundredth of a foot, and contours taken, left and right, from the line. This operation is repeated at 81 and sight is taken to face of drift.

(TO BE CONTINUED.)

## THE PROSPECTOR.

In his search for valuable minerals the prospector often finds himself unable to comprehend what he observes in nature. He has his conception of what certain rocks should look like, basing his judgment on what he may have learned in some district where he had fairly good facilities for information. If he has learned what he knows of rocks in a region of sediments which have been little altered, he would not, perhaps, recognize rocks formerly familiar to him because of their alteration in a country where igneous rocks have been thrust into the sedimentaries, and where there has been more or less metamorphism. The familiar, comparatively soft sandstone has become dense, hard quartzite; the gray lime is now found altered to white or blue marble, or perhaps to a fine grained quartz, or to a rock largely composed of garnet. The soft gray shales may be changed to hard, fine grained jasper, or to slates in which there is development of unfamiliar crystals. These and many other changes the prospector must learn to distinguish and understand in order that he may prosecute his search with intelligence. He must learn to distinguish faults and their relative age; to tell a recent fault from an older vein; to know the difference between a vein and a zone of mineralization; to notice and understand folds and unconformities in the rocks, and many other things, all of which apply directly to his trade as a prospector.

The rocks from Bodie, Cal., are classed as follows: No. 1, felsite; No. 2, diorite-aphanite; No. 3 is a fine-grained phyllite or hydro-mica schist, containing a large percentage of small crystals of zinc blende. When scratched by a knife the streak leaves a luminous trail momentarily behind it. This has been called "luminescent sphalerite." It is a property not uncommon in zinc blende. No. 4 is a granular

\*Abstract Trans. Canadian Soc. Civil Engrs.



quartz ore. It contains finely disseminated pyrite. No. 5 is galena in a gauge of iron carbonate and dolomitic mineral; No. 7 is a fragment of rhyolite decomposed by surface weathering; No. 8 is a variety of opal, a hydrous silica.

The rock from Manila, P. I., is a much altered hornblende granite. The light colored scales are secondary mica resulting from the alteration of feldspar. If gold bearing, as stated, an effort should be made to locate the principal deposits or enrichments whether as chimneys or veins. If no veins or zones of mineralization are found, the probability is that the values will not be found to go very deep.

The rocks from Searchlight, Nevada, are: No. 1, iron stained limestone; No. 2, largely quartz in a brecciated mass. The indications are that this rock may have originally been limestone, which has been replaced by silica. It should be assayed for values in gold and silver.

The mineral specimen from Princeton, Granite county, Mont., is crystallized limestone (marble), in which is disseminated small grains of pyrrhotite, a magnetic sulphide of iron, sometimes containing nickel.

The rock specimen from Blackbird, Idaho, is very much altered and seems to have been originally a basic dike rock. It shows a slight efflorescence of copper carbonate, and considerable carbonate of lime. It may be that on sinking a shoot of ore will be found. This is not an easy matter to predict, however. Some prospecting should be done at greater depth.

The "red rock" from Patagouia, Ariz., is jasper the hard shining portion, and hematite (iron oxide) the soft portion. Occasionally rocks of this description contain gold and silver.

The three rock specimens from Yale, B. C., are: No. 1 is slate, apparently an ancient tuff, composed of alternating layers of volcanic debris and fine mud, latter probably derived from the wearing down of an older rock; No. 2 is a much altered rock, evidently a greenstone. It carries a large percentage of pyrrhotite, a little pyrite and still less chalcopryite. Quartz grains are abundant; No. 3 is an altered intrusive rock — granite or syenite — too much decomposed to identify. The rock contains cubes of partly altered pyrite.

The five rock specimens from Santa Ana, Cal., are: No. 1 is aplite, a micaless granite; No. 2 is syenite. The rock consists almost wholly of orthoclase feldspar and altered hornblende. A very small amount of quartz is present. This rock approaches closely the typical syenite; No. 3 is the ordinary granodiorite of California; No. 4 is fine granular quartz stained with manganese oxide. The green color is due to copper carbonate; No. 5 is granular quartz, with brown iron oxide. The transparent crystals are gypsum-calcium sulphate.

### Dewhurst Slag Ladles and Cars.

The Wellman-Seaver-Morgan Co., Cleveland, O., have sole American rights for the manufacture and sale of the Dewhurst slag ladles and cars, illustrated herewith. Hand tipping is done away with, the ladles being tipped by a pull of the locomotive on the tipping chain. There are no power cylinders, gears

end, one for hooking to the car and the other for hooking to the locomotive. This chain may be hooked to either end of the car, as required. The locomotive pulls away from the ladle while dumping. Hence, if the chain should break, the locomotive is not endangered, but will run away from the ladle instead of toward it. When the slag has been dumped the ladle rights itself by gravity, by merely backing the locomotive. A train of side-tipping ladles can be tipped in series by attaching the hook of each ladle to the car ahead of it. The end-tipping ladles are tipped by a direct pull of the locomotive from the opposite end of the car, the locomotive pulling away from car.

On all ladles a forged steel band is attached, running around the ladle slightly below the rim. By fixing the tipping point high on the ladle, the leverage is increased and the tipping process made easier.

Double trunnions are cast on each side of the ladle, being located slightly above the axis, so that the ladle will right itself from any point to which it might be tipped. Roller bearings are provided on which the trunnions rest.

The ladles are of special shape, to facilitate the stripping of the slag and skull. Hence, in dumping, the skull follows the molten slag, requiring no hand work for its removal. The whole of the work is handled by the locomotive and its crew. The ladle is cast in a single piece, and heavily ribbed on the outside to stiffen it and increase its strength.

Cars are built for standard gauge tracks, and are equipped with either four or eight wheels, as may be required. They are built in a variety of sizes, ranging in capacity from 70 to 280 cubic feet in side-dumping pattern, and from 70 to 210 cubic feet in end-dumping pattern, the 210 cubic foot car of each being their standard size. Further details will be furnished by the builders on application.

### Pacific Coast Water Powers for Electrical Operation of Railroads.

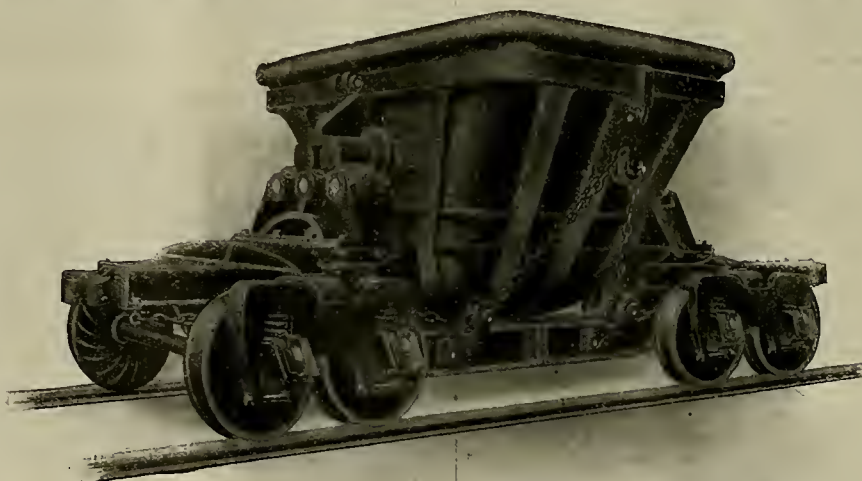
"The Use of Pacific Coast Water Powers in the Electrical Operation of Railroads" was the title of an interesting paper read before the Pacific Coast

was called to the wide-spread consideration now being given to the application of electricity as motive power to replace steam locomotives on railroads, reference being made to the large undertakings of this nature under way by the New York Central and the Pennsylvania Railroad Companies.

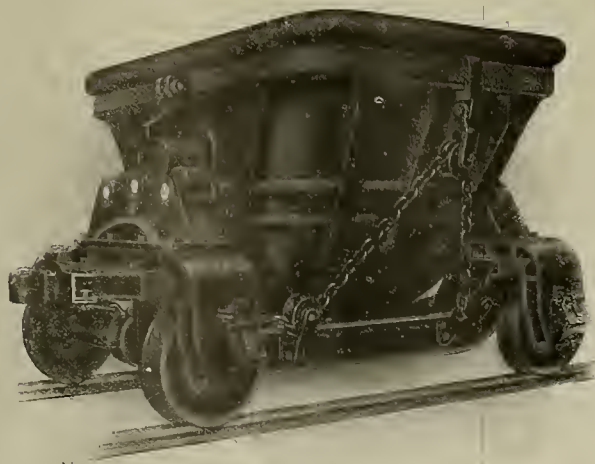
The advantages of electric traction over steam for the operation of railroads were considered under three heads, viz.: 1—Those appealing to the passenger and resulting in an increase of traffic. 2—Those pertaining to the centralization of power; and 3—The economies in first cost, maintenance and operating expenses.

Under the advantages to the passenger was mentioned the freedom from dirt and smoke, the universal cleanliness and the better ventilation and lighting of electric cars. Reference was made to the possibilities of obtaining higher average and maximum speeds with electric operation and to the greater tractive effort resulting from the increased weight on the driving wheels.

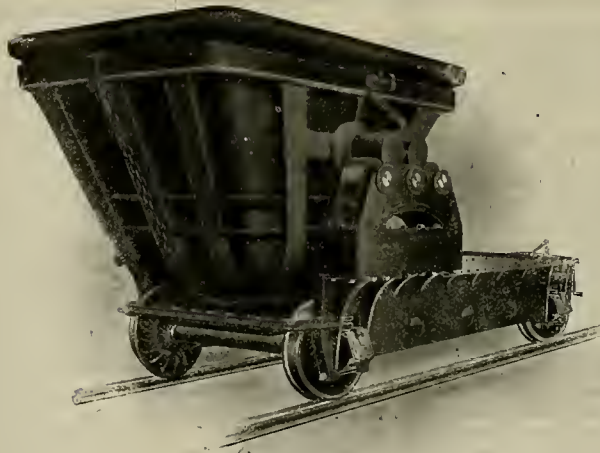
Under the advantages of a central power station the author spoke of the present-day limitations of the steam station and of the self-evident possibilities of obtaining power from hydro-electric plants. Particular reference was made to the conditions on the Pacific coast, where available water powers are distributed at frequent intervals from southern California to British Columbia. While but a small portion of these water powers have been developed, even with the stations now operating and the transmission systems now carrying power throughout the central portion of the State, the conditions would seem to make profitable the operation of at least some of the railroads by electricity. It was stated that the capacity of the steam locomotive has to be that of the maximum effort required from it, even though that effort be for a very short time, while, on the other hand, the load on the power station is only the sum of the loads on the different motors, which will average much less than the sum of their maximum powers. This materially reduces the cost of operating, especially with the conditions found on the Pacific coast, where several power plants can feed into one network and supplement the power of each other.



Dewhurst Slag Ladle and Car; Side Tipping; Double Truck.



Dewhurst Slag Ladle and Car; Side Tipping; Single Truck.



Dewhurst Slag Ladle and Car; End Tipping.

or tipping poles required. It will be noted that the chain and tipping mechanism for side-tipping ladles can be placed on whichever side of the car the dumping is to be done. The chain runs over steel snatch blocks and guide pulleys, the latter and two of the snatch blocks being attached to the car, and the other snatch block being attached to the ladle as shown. The chain is provided with hooks at each

Railway Club on the 21st ult., in San Francisco, Cal. The paper was presented by Robt. McF. Doble, consulting engineer of the Abner Doble Co. of San Francisco, and was illustrated with views and diagrams of steam locomotives, electric cars and locomotives, track and rolling stock of California roads, hydro-electric plants, and a State map showing the location of power plants and transmission lines. Attention

The possibility of recovering energy lost in braking was also referred to, the example of several European railways being cited to emphasize the fact that this has been practically accomplished. In such a system of distribution as is possible in California, considerable power might be generated by trains descending mountain divisions and this fed back and utilized. Under the third heading reference was made to the



saving in the cost and maintenance of track, the possible increase in capacity of existing railroads, the saving of time and labor in the operation of an electric locomotive, its characteristic simplicity and the rapidity with which repairs can be made. The power which can be obtained from steam locomotives is rapidly approaching its limit, while the development of the electric locomotive has apparently only begun. The relative reliability of the steam and electric was held to be in favor of the latter, especially in consideration of the local conditions in California, where a number of water-power plants feeding into the same distribution system would make exceedingly remote the possibility of breakdown of anything more than an individual locomotive, and the chances for that were only half those for the steam locomotive.

For comparison, Mr. Doble next considered briefly some of the typical modern steam locomotives, such as those of the Southern Pacific Company, the 4 cylinder balanced compound 3000 type of the New York Central, and the large Hallet articulated compound built for the Baltimore & Ohio Railroad.

After some general observations on the development of electric traction, with special reference to its growth in California, the author took up the discussion of several different types of electric locomotives using direct current, particular mention being made of those built for the Baltimore & Ohio and the New York Central Railroads. The "6000" New York Central electric locomotive was described in detail, attention being called to its interesting electrical features and to its remarkable power and speed qualities as developed in the recent tests. Comparisons were also made between the electric and the heaviest Atlantic type steam locomotive of the New York Central, with particular reference to the increased draw-bar pull per pound of weight of the former.

The advantages of the multiple unit direct current system were next treated, mention being made of some of the typical installations in the Eastern States, as well as the Key Route and North Shore Railroads near San Francisco.

Under alternating current polyphase systems, Mr. Doble discussed the progress which had been made along that line in Europe, and described the Valtellina, Jungfrau and Burgdorf-Thun systems. Mention was also made of the remarkable Berlin-Zossen high-speed trials.

Single-phase systems were next taken up, attention being called to the pioneer work of B. J. Arnold, the General Electric and Westinghouse systems and their special features, and the system designed by J. H. Hallberg.

Turning to the achievements of electric traction in California, particular reference was made to the Los Angeles & Redondo Railway, the Pacific Electric Railway of Los Angeles, and the North Shore and Key Route systems of San Francisco. The North Shore Railroad is of special interest by reason of its being the first and only third-rail line in California, and because of its being operated from a sub-station which is the terminus of one of the longest transmission lines in the country. The Alto station referred to is 180 miles from the hydro-electric plant at Colgate, and 250 miles from the new De Sabla power house. One of the features of the Key Route system, which was given considerable attention, was the Diamond trolley, which is successfully used on all of its trains. The possibilities of this collector for heavy railroad work were pointed out.

As to projected electric lines on the Pacific coast, reference was made to improvements which the Southern Pacific Company has under consideration for its suburban lines in Oakland, Berkeley and Alameda, to the rumored electrification of that company's San Jose and Port Costa lines, and also to the possibility of operating its mountainous divisions by electricity. Mr. Doble concluded with some interesting remarks on the leading hydro-electric power stations and transmission systems of California. The distinguishing characteristics of each plant were mentioned, and special reference was made to the new De Sabla power house of the California Gas & Electric Corporation, where is now operating an 8000 H. P. tangential water wheel, stated to be the largest single water wheel ever constructed. This station regularly supplies power to San Francisco and other points 300 miles distant.

### The Simplon Tunnel.

The Simplon tunnel, driven through the Swiss Alps, met with many obstacles during construction. It is 12½ miles long, and is the longest tunnel in the world. Its altitude above sea level (2310 feet) is much lower than that of any other Alpine tunnel, which accounts for its great length. The Arlberg is 6½ miles long and 4300 feet above sea level. Work was started in August, 1898, simultaneously from the Swiss and Italian sides. All the workmen (10,000) are Italians, 4000 beginning work at Brig, Switzerland, and 6000 at Iselle on the Italian side. It was believed that the rocks were composed of vertical strata, but they proved to be horizontal on the Italian side. Great streams of water were met, which required much energy and skill to turn aside. After this difficulty had been overcome the engineers came upon a bed of moving sand. Heavy timbers were used to stem its rush, but they went to pieces

under the enormous pressure and were replaced by steel stays to hold up the metal plates to keep out the sand. Last but not least, hot springs were encountered around which they had to work.

The rock through which the tunnel is being driven is mostly granite. By means of machine drills the Swiss side was advanced 20 feet daily, and often more, an unprecedented result. The drill used is 3 inches in diameter, rotates slowly and is kept at its work by a hydraulic pressure of 1500 pounds to the square inch or ten tons on the cutting face of the drill. The water encountered is discharged along the axis of the tool, and in this way it is kept cool and the rock cut away is washed out. The entire undertaking consists of two parallel single tunnels 56 feet apart, which are connected at every 300 feet by transverse galleries. By means of these galleries one tunnel will ventilate the other.

The workers in the tunnel are supplied with 58,000 cubic feet of air per minute, spray and ice arrangements being introduced for cooling the air. The water discharged from the north and south ends of the tunnel by means of drains is 5000 gallons per minute. Shifts were changed every eight hours. The men are brought out in heated cars and taken to a warm station, where they change their clothes. Ample provision for hot and cold douche baths was made. The workmen's clothing was hung up in hot rooms to dry, in order that it might be in a fit condition for the next day's work. A restaurant was connected with the station, where food of excellent quality was served at a small price. Sleeping apartments were also arranged for the men at a very low price.

The tunnel cost nearly \$20,000,000. When the hot springs were met it was an impossibility for men to continue at work beyond thirty minutes at one time on account of the excessive heat created by the hot springs, with a temperature of 46° C. (115° Fahr.) in the first gallery.

## Gold Mining in Rhodesia.

### NUMBER IV.

Written for the MINING AND SCIENTIFIC PRESS by F. C. ROBERTS.

Continuing the consideration of mining costs, the several factors have been treated separately, the cost per ton being based upon a tonnage of 44,011 tons. The most important of these are mine pumping, winding, underground tramming, rock drills and their sharpening, etc.

#### MINE PUMPING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
White wages.....	\$ 1,077 89	\$ 0.168	5.52
Native wages.....	591 74	.0154	3.03
Native food.....	242 44	.0062	1.21
Stores.....	507 03	.0148	2.91
Fuel.....	6,290 25	.1636	32.38
Maintenance.....	1,519 59	.0396	7.71
Workshops.....	2,675 61	.0696	13.72
Mill engine and boilers.....	1,705 45	.0444	8.72
Hauling engine and boilers.....	1,352 53	.0352	6.93
Pumping station.....	2,085 00	.0522	10.69
Compound.....	28 36	.0008	.15
Compressor.....	1,377 82	.0358	7.06
Totals.....	\$19,513 67	.5200	

#### WINDING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
White wages.....	\$1,232 50	\$ 0.0320	17.33
Native wages.....	263 23	.0068	3.08
Native food.....	81 12	.0021	1.24
Stores.....	363 13	.0094	5.12
Fuel.....	1,933 27	.0516	27.90
Maintenance.....	124 61	.0032	1.77
Workshops.....	728 34	.0190	10.23
Hauling engine and boilers.....	2,312 35	.0600	32.54
Electric lighting.....	20 71	.0006	.27
Totals.....	\$7,109 36	.1800	

#### UNDERGROUND TRAMMING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 192 41	\$ 0.0076	1.80
White wages.....	3,762 80	.0978	23.38
Contractors.....	156 16	.0040	.96
Native wages.....	6,380 33	.1660	30.52
Native food.....	2,046 24	.0766	18.23
Stores.....	1,749 77	.0456	10.87
Maintenance.....	228 37	.0058	1.41
Workshops.....	69 99	.0018	.42
Compound.....	564 99	.0142	3.48
Totals.....	\$16,111 56	.4200	

#### COMPRESSOR AND MACHINE ROCK DRILLS.

	Total Cost.	Cost Per Ton.	Total Cost, %.
White wages.....	\$ 1,220 17	\$ 0.0318	6.50
Native wages.....	828 08	.0216	4.41
Native food.....	227 25	.0058	1.24
Stores.....	2,269 46	.0590	12.08
Fuel.....	375 26	.0095	1.99
Maintenance.....	7,557 79	.1966	40.22
Workshops.....	1,989 32	.0518	10.58
Mill engine and boilers.....	1,477 62	.0384	7.87
Electric lighting.....	2,810 79	.0730	15.00
Compound.....	30 67	.0008	.15
Totals.....	\$18,790 09	.4810	

#### ROCK DRILLS AND SHARPENING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
White wages.....	\$ 803 04	\$ 0.0236	19.89
Native wages.....	334 47	.0086	7.41
Native food.....	157 00	.0042	3.25
Stores.....	1,179 15	.0306	26.37
Charcoal.....	955 97	.0244	21.30
Workshops.....	930 32	.0258	20.76
Transport.....	12 12	.0004	.38
Compound.....	24 43	.0006	.54
Totals.....	\$ 4,623 59	.11	

#### HAND DRILLS AND SHARPENING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
White wages.....	\$ 3,024 29	\$ 0.0786	31.07
Native wages.....	504 30	.0132	5.17
Native food.....	212 29	.0052	2.10
Stores.....	3,839 37	.1084	34.82
Charcoal.....	1,539 08	.04	15.79
Workshops.....	991 09	.0258	10.15
Transport.....	12 12	.0002	.15
Compound.....	36 49	.0008	.10
Totals.....	\$ 9,739 91	.258	

#### SORTING AND CRUSHING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 308 65	\$ 0.004	1.18
White wages.....	1,148 79	.0298	12.95
Native wages.....	2,395 74	.0624	27.00
Native food.....	1,080 77	.028	12.18
Stores.....	418 13	.0108	4.70
Fuel.....	492 51	.014	6.12
Maintenance.....	557 57	.0146	6.28
Workshops.....	690 91	.018	7.76
Mill engine and boilers.....	1,178 40	.0380	16.78
Electric lighting.....	16 97	.00001	1.16
Compound.....	137 97	.0036	1.53
Totals.....	\$ 8,816 72	.23	

#### SURVEYING AND SAMPLING.

	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 418 24	\$ 0.0112	5.12
White wages.....	18 54	.006	3.42
Native wages.....	152 52	.0040	18.60
Native food.....	69 23	.0018	8.49
Stores.....	56 11	.0014	7.27
Maintenance.....	77 16	.002	0.70
Compound.....	7 67	.0002	1.21
Totals.....	\$ 797 47	.021	

**MILLING.**—The introduction of heavy stamps, with an object of obtaining a large stamp duty, seems to have reached its practical limits, i. e., 1465 pounds. In Africa the mill is operated more as a crushing machine, than with an idea of effecting perfect amalgamation, and so long as the ores being dealt with lend themselves readily to subsequent treatment by cyanide, in the state of fineness produced through using a low discharge, and a coarse screen (20 to 25 mesh), a high duty may be expected to be retained. The popular method of operating the stamp mill, that is to say, the number and order of drops, is as follows:

Order of drop..... 1, 3, 5, 2, 4  
Height of drop..... 8 inches  
Number of drops per minute..... 4.96

As a further means of increasing the stamp duty, double crushing with rock breakers is resorted to, when the product being fed to the mill is, in the first case, crushed to about a 2½-inch ring and then passed over grizzlies, the coarse being fed to No. 2 crusher, when it is reduced to about a 1-inch ring.

This method of relieving the stamps might, in the opinion of the writer, be economically extended to a No. 3 crusher.

That most important branch of mining, "sorting," is almost entirely neglected in Rhodesian practice, and many tons of rock are sent through the mill, which is not high enough in grade to compensate for the wear and tear for which it is responsible.

Extending over a period of twelve months, with rock breaker capacity sufficient to reduce the product to a 2 inch ring before entering the mill, the writer has obtained a duty, with 1265-pound stamps (an effective duty of 1150 pounds), of 5.5 tons per stamp per day, using a 2½-inch discharge, 20 mesh screen, 7 tons of water per ton of ore, and the mill running at ninety-six 8 inch drops per minute.

It is a well-known fact that the stamp mill, under ordinary conditions of use, performs a large amount of unnecessary work, that is to say, the product, when it has been reduced to the fineness indicated by the screen being used, is not immediately discharged, hence the ore is reduced to a much finer state of division than there is, from a crushing point of view, any necessity for.

In recent years a great deal of attention has been given to this subject, with the result that there is at present several subsidiary crushers on the market, for which various results are claimed, when used in connection with the stamp mill. As an illustration of the product furnished from the stamp mill, it may be stated that the writer has found through sizing the product produced when using a 10-mesh screen, and the other operating conditions being similar to those noted above, that 82% of the discharged product will pass through a 30-mesh screen, and by further sizing, recrushing the oversize to a uniform fineness to pass a 30-mesh screen, it is possible to obtain a duty of nearly 9.5 tons per stamp per day.

In this case a 30-mesh screen was used because it was possible to obtain a maximum extraction when the ore was reduced to this fineness. Other experiments carried out upon the same lues gave equally satisfactory results, although the increased duty is, of course, proportional to the state of fineness desired.

The writer is at present making some further tests upon a working scale, which should furnish some interesting results.

(TO BE CONTINUED.)

As SCIENTIFIC investigation proceeds, it is found that some of the more rare minerals possess remarkable and valuable properties when associated artificially with some of the most abundant of the world's minerals. Iron is one of the most abundant and most widely distributed of minerals. Molybdenum in its



several forms is of comparatively rare occurrence. Nickel, also, is far from common. Tungsten is seen so seldom as to be wholly unknown to most of those whose business is mining, and yet the association of either of the above mentioned rare metals with steel produces marvellous effects, toughening and hardening the steel to a greater extent than has ever been found possible without them; and yet this branch of metallurgy is practically in its infancy. The number of substances known to us as elements have increased by the discovery of new elements from time to time, and without doubt the intelligent investigations constantly in progress will result in the discovery of still other unresolvable substances. Twenty-five years ago sixty-four elementary substances were known. The list to-day comprises at least seventy-five, with the possible addition of one or two more—radium being one of them. It is not claimed by chemists that all of the known elements of to-day are simple substances, unresolvable into more than a single substance, for further research may discover this to be untrue.

### Coolgardie, Australia, Pumping System.

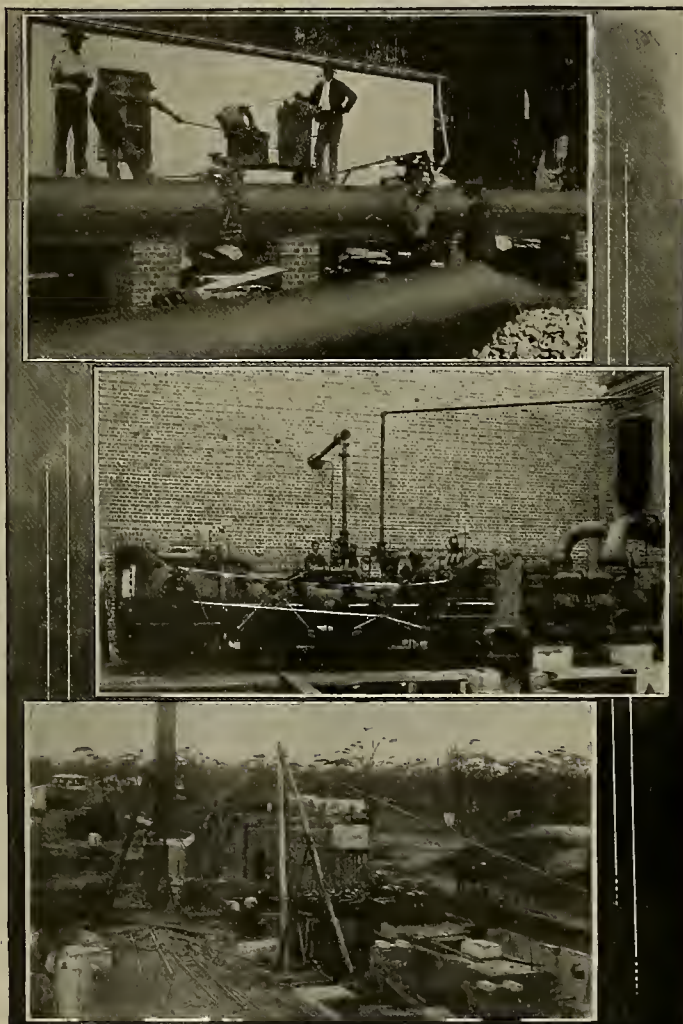
The Coolgardie goldfields, which is a common name for the great groups of mines at Kalgoorlie and Coolgardie and the immediate neighborhood, lie 363 miles

sumption, was worth 2s 6d per gallon, and scarce at that. The Government excavated tanks and built dams on the roads to the fields. As the mines developed, at the lower levels salt water was found, which was distilled and sold at 70s per 1000 gallons. In this way some sort of a provision was made, but the water supply was still a danger point in connection with the fields. Typhoid fever raged. Owing to the extreme saltiness of the water (there being 30 ounces of saline matter to the gallon), a quantity of fine gold was lost.

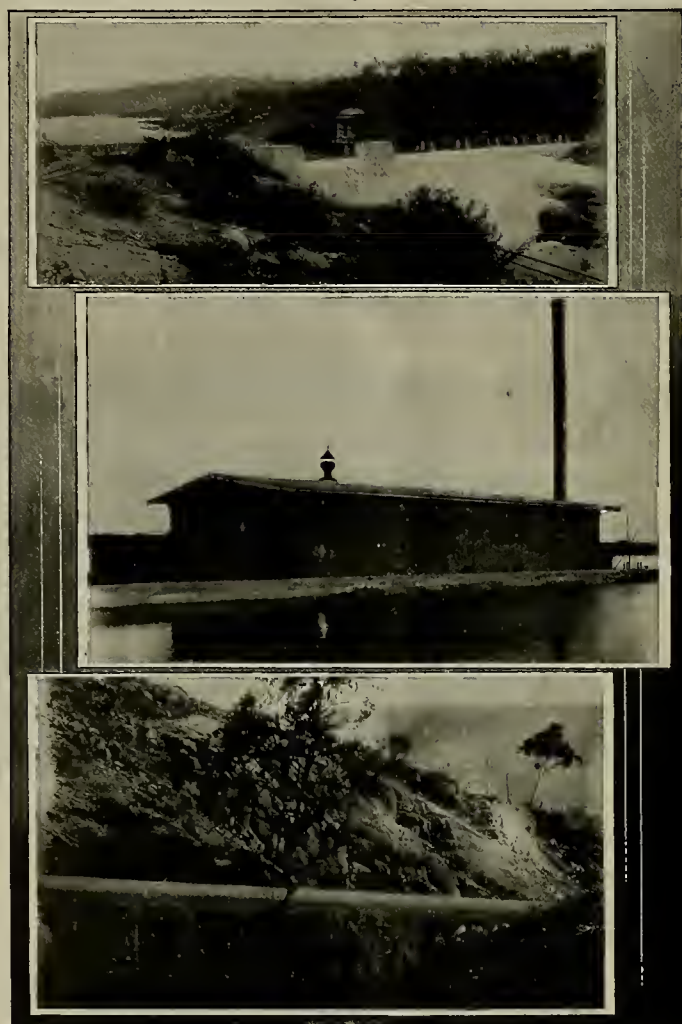
In 1894 the railway had been extended to the Goldfields, i. e., Coolgardie and Kalgoorlie. The difficulties of working the traffic were enormously increased owing to the trouble of obtaining fresh water at almost any price. For example, the cost of water alone to the railway department was £1000 per day during the summer. Such a state of affairs could not last, as it meant an immense increase in the cost of living on the fields. As gold was being found at other places, such as Menzies, Leonora, etc., the railway would of necessity have to be extended, and water, therefore, was indispensable. Various schemes were propounded, and several offers were made to the Government by groups of capitalists to build and work water works to supply the fields if a concession was granted them. An attempt was made to obtain water by boring, but after going down 3000 feet through granite the attempt was given up.

tions were carried down nearly 100 feet below the level of the river. At the base of the foundations the thickness of the dam varies from 85 to 120 feet, tapering to a width of 15 feet on the top; 69,000 cubic yards of concrete were used in the construction. The surplus water flows over the crest of the dam. The reservoir or lake thus formed is 8 miles long and contains, when full, 4,600,000,000 gallons of water. The catchment area consists of 850,000 acres, and consists chiefly of granite hills. The water is exceptionally good. At a trifling cost it would be possible to divert other streams into the reservoir, and so largely increase its capacity. Suitable valve towers are provided to regulate the flow to the first pumping station.

A patent locking bar pipe was used. This pipe consists of two steel plates rolled into semi-circular form, the edges being upset and a locking bar forced on. The joint is then finally clamped or closed by hydraulic machinery. The diameter of the Coolgardie pumping mains is 30 inches, each pipe being about 28 feet in length, made of plates  $\frac{1}{8}$ -inch thick, and weighing about 1½ tons. In some sections, where extra pressure existed, the pipes were made of plates  $\frac{1}{4}$ -inch thick. The total number of pipes required was about 60,000 for the main to Coolgardie, and the total estimated weight of steel plate was about 76,000 tons. Each pipe was subjected to a hydraulic pressure test of 400 pounds to the square inch, was then



Running Lead in Joint.  
Engine in the Course of Erection.  
Foundations for Boilers and Engines.



Helena Wier.  
Pumping Station No. 5.  
Pipe Crossing Gully

Scenes Along the Kalgoorlie, Western Australia, Pipe Line.

in a direct line from the port of Fremantle, on the west coast of Australia. The first 100 miles crosses a series of granite ranges averaging 1200 feet high, covered with gum trees, etc. The country then becomes a series of broken rolling plains, gradually rising toward Coolgardie. The soil, with the exception of a few patches, is sandy and covered with scrub gum trees, etc. The average rainfall is 7.14 inches, evaporation 82.6 inches, with a temperature often over 100° F., there being in the old days only a few soaks and native wells available for the supply of water.

In 1892 the first discovery of gold in paying quantities was made near the site of the present town of Coolgardie. Until the discovery of gold, this desolate and waterless country had been crossed several times by explorers. When the great rush of 1893 set in, the want of water caused suffering and loss of life, largely due to typhoid, and as the railway only ran to Southern Cross, 25 miles from the coast, the remainder of the distance had to be done in stage coaches or other vehicle. As the gold area increased and the gold-bearing reefs and formations showed signs of permanence, the Government did all possible to minimize the suffering and loss due to the shortness of water. Inferior water, hardly fit for human con-

C. Y. O'Connor was instructed to inquire into the cost and best method of carrying out a scheme for the supply of water from the coastal or well-watered districts. In July, 1896, he reported in favor of a scheme which consisted of a reservoir to be built on the Helena river, near Mundaring, in the Darling ranges, 20 miles from Perth, the water to be then pumped through a main to Coolgardie. In the first place 1,000,000 gallons was estimated as the probable requirement. This quantity was, however, increased to 5,600,000 gallons per twenty-four hours, and the estimated cost was set down at £2,500,000, exclusive of the reticulation of the towns en route. In September, 1896, was introduced the necessary bill, which met with opposition but was ultimately passed. In September, 1898, the Goldfields construction bill was passed by the Legislative Assembly. The main supply reservoir is situated in the Darling ranges, 30 miles from Perth, 320 feet above sea level, where two great arms of granite jut out across the narrow valley, at the bottom of which flows the Helena river. A gigantic dam of concrete is placed like a huge wedge between these two granite arms, thus closing up one end of the valley. It is 760 feet long and 100 feet high in the deepest part, and the founda-

immersed in a bath of hot asphalt and kept there until the steel rose to the same temperature as the bath itself, this coating to act as a preservative against rust. The circumferential joint consisted of a forged steel sleeve with a lead caulked joint. The pipe was laid partly in a trench and then covered to a uniform thickness of 2 feet with soil, except where it ran through salt country, where, to avoid corrosion, the pipe was laid on trestles and protected from the sun by suitable coverings. No expansion joints were used or found necessary. The lead joints of the circumferential steel sleeves were made by a specially designed caulking machine, this machine being driven electrically for a considerable portion of the time, but latterly the electrical drive had to be abandoned, owing to difficulty in getting water for the engine, and the machine was worked by hand. The lead joint where the locking bar comes in was caulked up by means of a small hydraulic press. An average of from twenty to thirty joints per working day of eight hours was accomplished by the machines. The pipe contracts were signed October 24, 1898, by two Australian firms, Mephan-Ferguson and Hosking Bros., who erected special works at Midland Junction and Falkirk, West Australia. The total contract price



for the pipes delivered to works in West Australia amounted to £1 025,000.

As the Coolgardie water supply scheme had to depend absolutely on mechanical means for forcing water through, the question as to the type of machine and boiler had to be gone into carefully, as the entire success of the scheme depended on the working of the pumping machinery. The problem was to pump 5,600,000 gallons for twenty-four hours against a total estimated head, including friction, of 2,700 feet, through a pipe 30 inches in diameter, and roughly, 330 miles, the speed of the water through the pipe being taken at about 2 feet per second.

From stations 1 to 4 in each station there are three complete sets of pumping machinery and boilers, any one of which is capable of pumping 2,800,000 gallons per twenty-four hours against a head of 450 feet, so that, to get the full quantity of water, two sets of engines and pumps are always pumping together into the main, and one set is "spare." From stations 5 to 8, inclusive, there are at each station two sets of

elevation of 1457 feet. Each station is provided with concrete tanks of 1,000,000 gallons capacity, which acts as combined receiving and suction tanks. From Dedari the water is pumped a distance of 12 miles to the main service reservoir at Bulla Bulling. This reservoir is of concrete reinforced with barbed wire strands, and holds 12,000,000 gallons. Bulla Bulling supplies a small service reservoir of 1,000,000 gallons on Toorak hill, overlooking the town of Coolgardie, the mean elevation being 1525 feet. The total head pumped against in daily working at stations Nos. 1 to 4 varies from 360 feet to 410 feet, depending on whether one or two engines are working. At stations Nos. 5 to 8 the head is from 180 to 210 feet. From Toorak tank the water runs by gravity to a reservoir on Mount Charlotte, which is to supply the town of Kalgoorlie.

In October, 1899, tenders for the machinery were called for by the Government, which, acting on the advice of its engineer experts in London and Australia, decided to accept the tender of Messrs. James

calorific value of 10,000 British thermal units per pound. The Government engineer for the Coolgardie water supply selected a group of machinery at the No. 2 pumping station, and at the No. 8 pumping stations for the purposes of running the official trials. At the No. 2 pumping station the trial resulted in a duty of 142,093,598 foot pounds of work being obtained per 1,000,000 British thermal units, showing margin of 7,093,598 foot pounds of work in favor of the engines. The working duty trial resulted in a duty of 144,427,000 foot pounds of work being obtained for each 160 pounds of coal consumed, showing a margin of 9,427,000 foot pounds in favor of the engines. The amount of water pumped during the twelve hours by the two groups of machinery was 2,998,081 gallons. At the No. 8 pumping station the trial resulted in a duty of 142,934,958 foot pounds of work being obtained per 1,000,000 British thermal units, showing a margin of 7,934,958 foot pounds of work in favor of the engines. The working duty trial resulted in a duty of 148,141,000 foot pounds of work being obtained for each 160 pounds of coal consumed, showing a margin of 13,141,000 foot pounds in favor of the engines. The quantity of water pumped by the engines during the twelve hours was 3,147,559 gallons, showing an excess of 347,559 gallons.

The fuel to be used is a local coal obtained from the Collie coal fields of Western Australia. It is estimated that 30,000 tons of coal per annum will be required when the plant is running full time—twenty-four hours. The Government has therefore put in railway sidings at each pumping station and has erected coal bunkers under cover capable of holding some 200 tons each. The trucks of coal are run onto an elevated timber gantry and the coal then unloaded.

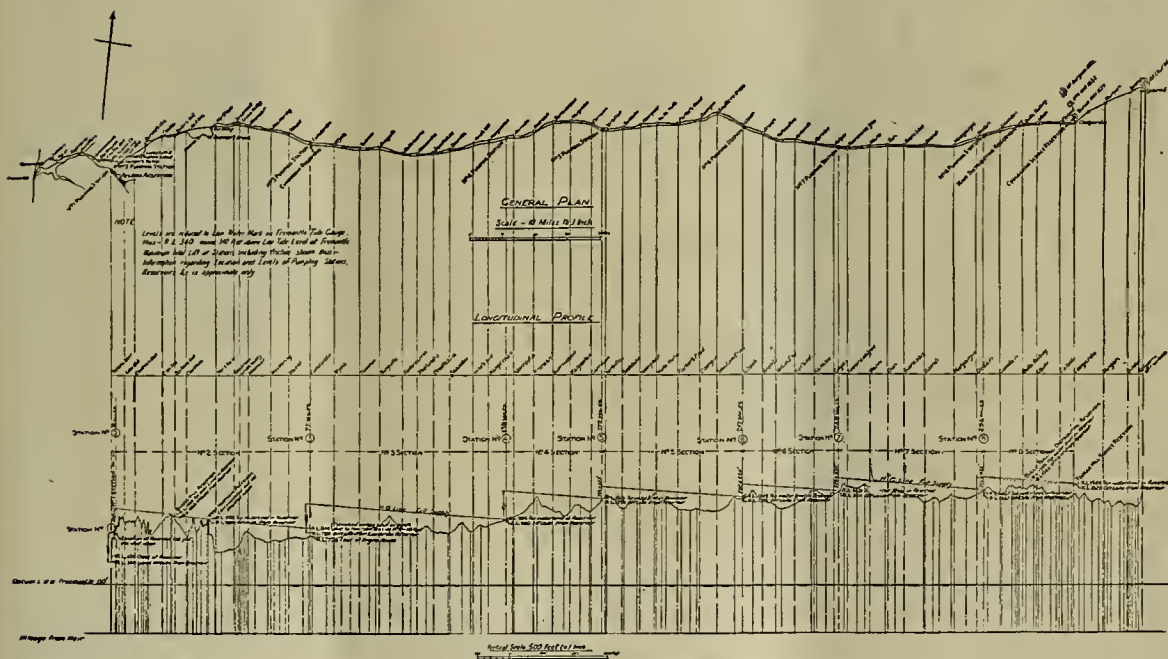
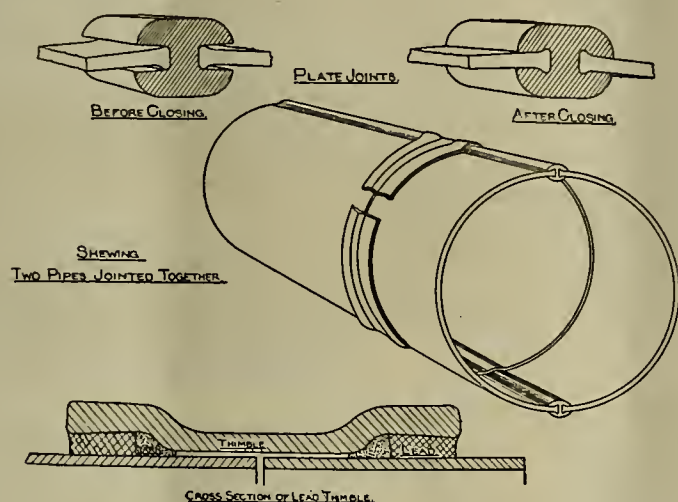
A great problem was to get the plant, which weighs 3500 tons, out to the colony, and when there to get each piece of machinery sorted and sent on to its proper station and erected—twenty groups, each consisting of an engine and boiler, distributed over 330 miles of country. An ingenious system of shipping was adopted. Each group was given a distinctive color and letter, and every part of the group was painted with the distinctive color to which it belonged. When the parts were cased one end of the packing case was also painted with the correct group color. In addition, each case or package was numbered consecutively and marked with the group letter. All marks were in duplicate, one set being painted on the case or package and the other stamped on sheet tin tabs which were fastened on to the cases or packages. No parts of the different groups were allowed to be packed in the same case. By these precautions all trouble was avoided. The railway, shipping and wharf men were supplied with colored group key plans, and so were able to pick out at once the various cases and packages belonging to each group and send them on to their correct destination. There were 5000 packages, and the only complaint received from the erection staff as to missing material referred to one ½-inch hydraulic valve.

In most countries where water works or other engines are to be erected the site of the engine house, etc., is situated within reasonable distance of some town or available place, where men could find lodging and food, and where supplies, stores, etc., could be obtained. On the Coolgardie contract this was not possible. Most of the engine sites are miles away from any source of supply, not only of food, but of what is in a dry country even more necessary—water. The time given for the completion of the work, viz., twenty-seven calendar months, was exceedingly short, bearing in mind its magnitude. It was, therefore, necessary to arrange for the engine and boiler erection to be carried on simultaneously at the eight stations. The arrangements were made as follows: Sufficient land was leased from the Government by the contractors, James Simpson & Co., Ltd.

This plot of land was enclosed and on it was erected the permanent camps, workshops and mess rooms. The object in having the land formally leased was to enable the contractors to insist that every one who came within the enclosure and enjoyed the use of the camp should conform to the regulations laid down for its running. The most stringent regulations as to sanitation were rigidly enforced, with the result that no serious case of illness in any of the camps occurred. In addition to the camps for the men to live in, small workshops were erected, both for the storage of tools, gear, machinery, and the carrying out of small repairs. At No. 3 station the general workshop and store was erected. The plant was driven by a suitable engine and boiler, and the largest lathe could handle the outside piston rods, some 17 feet long, or turn up a low pressure piston. In a country where labor is dear it paid to have the best mechanical appliances that could be bought. The plant was erected with care and has given results of value on the work.

Such, in abbreviated form, is the history of the

### MEPHAN-FERGUSON'S PATENT RIVETLESS OR LOCKING BAR STEEL PIPE.



Profile Along the Kalgoorlie Pipe Line.

machinery, each set of machinery being capable of pumping 5,600,000 gallons per twenty-four hours against a head of 225 feet, so that while one set is pumping the other set is "spare." Station No. 1 is close to the foot of the great dam on the Helena river. The water is elevated 421 feet in daily work into an open concrete tank of a capacity of 468,000 gallons, situated at No. 2 station, the total distance from No. 1 being about 1½ miles. From station No. 2 the water is pumped up about 360 feet through 23 miles of main to the first regulating tank at Baker's hill, about 1080 feet above sea level. This tank is of concrete, with a capacity of 500,000 gallons. The water runs from Baker's hill by gravity to a second regulating 500,000 gallon concrete tank at Northam, 18 miles farther on, the Northam tank being 94 feet lower than Baker's hill. Still falling, the water reaches the great tank at Cunderin, which holds 10,000,000 gallons, and is 78 miles from the Helena reservoir. Stations 3 to 7 pump the water against a steady rise to the eighth station at Dedari, a distance of 217 miles from Cunderin, and situated at an

Simpson & Co., Ltd., of London, a special clause being inserted in the contract giving them permission to have half of the manufacturing done by the Worthington Company. The contract with the West Australian Government provided that each of the pumping engines should attain throughout a twelve-hour trial a duty of 135,000,000 foot pounds of effective work per 1,000,000 British thermal units supplied to the engine, which would not be returned to the boiler in the ordinary course of working. It also provided that, for the purpose of testing the combined working duty of the pumping engines and boilers, two groups of machinery at one of the first four stations and one group of machinery at one of the second four stations should be capable of pumping through the main to the next reservoir not less than 2,800,000 imperial gallons of water during a twelve-hour trial; and that the combined duty of the group should throughout such a trial amount to at least 135,000,000 foot pounds of effective work for every 160 pounds of coal consumed, such coal being equal to a fair sample of good Collie (W. A.) coal, having a



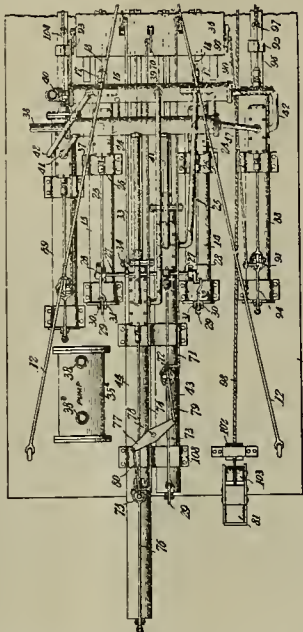
greatest pumping scheme that has ever been carried out. The whole scheme was started and the water pumped through to Kalgoorlie without a single accident. The scheme has now been working for over two years without accident.

## Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 14, 1905.

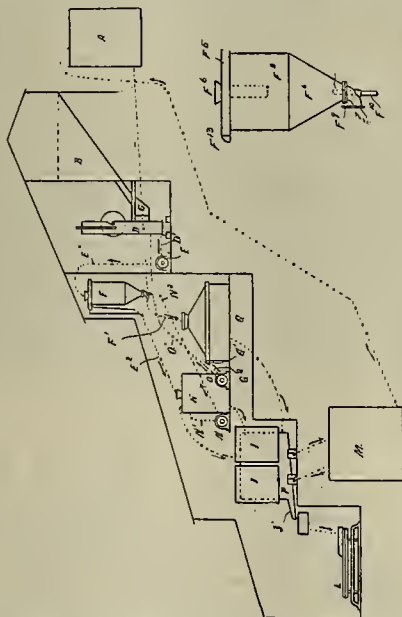
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

EXCAVATING MACHINE.—No. 781,738; N. D. Petrie, Celina, Ohio.



In excavating machine, turntable supporting dredging mechanism, pair of cylinders, connection between piston rods of cylinders and turntable, means for supplying water under pressure to either cylinders to exclusion of other thus to effect rotation of turntable, and means actuated by driven piston to effect automatic shutting off of water to that cylinder.

PROCESS OF TREATING PRECIOUS METAL-BEARING ORES.—No. 781,711; A. H. Brown, Boulder, Colo.

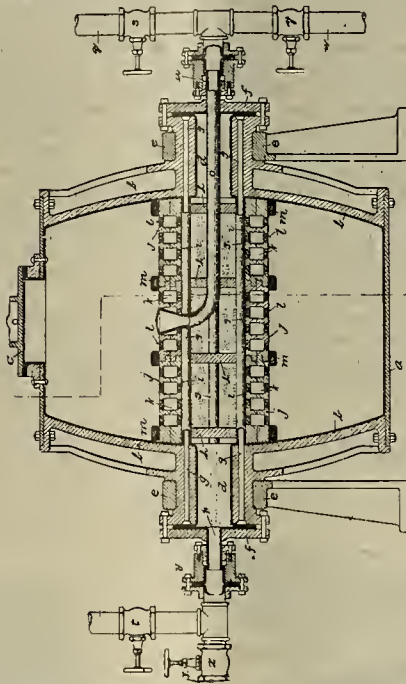


Process for treatment of ore consisting in pulverizing ore in presence of cyanide solution, subjecting ore to hydraulic classification by introduction of cyanide solution at bottom of overflow tank to produce ascending current; leaching ore by use of cyanide solution whereby finer values of ore are dissolved; removing dissolved metallic values from ore in any suitable manner; and subjecting residue of ore to concentration.

PROCESS OF SMELTING NATIVE COPPER-BEARING ROCK.—No. 781,807; F. R. Carpenter, Denver, Colo.

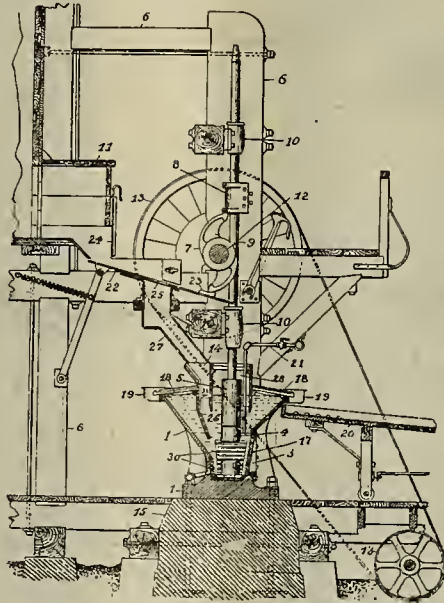
Process of smelting native copper-bearing rock which consists in adding thereto basic material, to form slag and sulphide material to form matte or carrier for native copper and incidentally gold and silver that may be present and smelting mixture.

BARREL FILTER.—No. 782,031; H. C. Holthoff, Milwaukee, Wis.



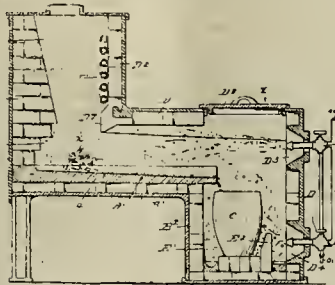
In barrel filter combination with rotary barrel of approximately cylindrical filter frame arranged axially within barrel and composed of sectional inner and outer shells having coinciding cells and perforations in inner and outer walls of cells, and suitable filter body interposed between shells.

STAMP MILL.—No. 781,912; R. Schorr, San Francisco, Cal.



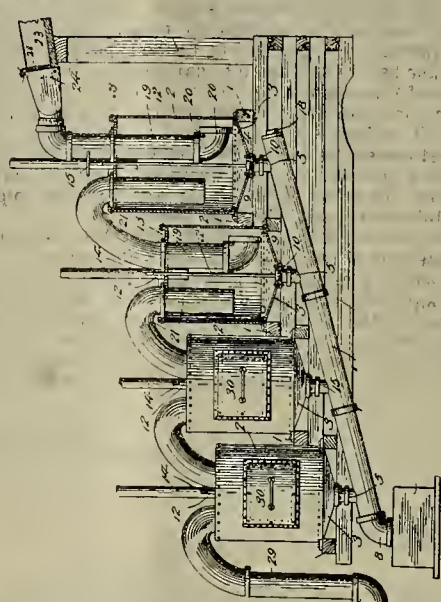
In stamp mill for crushing ore, mortar, with outwardly flaring sides, die in bottom thereof, dropping stamp therein, means for supplying water thereto, screens at top of mortar extending inwardly from top of flaring edge, and means for conveying away water and suspended material passed through screens by action of stamp.

FURNACE.—No. 782,438; Louis De Rome, San Francisco, Cal.



Furnace consisting of inclined hearth with escape flue rising from near head thereof, roof overhanging hearth, reservoir adapted to contain crucible below lower end of hearth, draw-off spout from bottom of reservoir, furnace front having burners projecting therethrough, one discharging within reservoir and other directed upon hearth, closed opening through roof coincident with reservoir, depending lip from roof at angle of flue, and a projection of rear wall overhanging head of hearth.

AMALGAMATOR.—No. 782,611; M. V. Lasswell, Oakland, Cal.



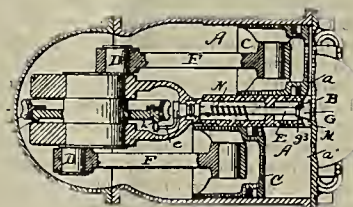
In fine gold amalgamator, plurality of containers communicating with each other and provided with openings in bottoms, sluice box communicating with initial container, yoke-shaped bearings secured to sluice box, shaft rotatably and removably journaled in bearings and provided with grate bars depending across sluice box, pipe having one end communicating with receptacle and its other end open, removable plug mounted in open end, couplings connected to pipe and bottoms of containers and through which openings communicate with pipe, valve plugs rotatably mounted within openings, and operating rods each having one of ends connected to one of plugs and other end extending upwardly through cover of container.

PROCESS OF INDUCING A FLOW OF OIL FROM OIL WELLS.—No. 782,233; B. F. Gardner, Chicago, Ill.



Process of inducing flow of oil from oil well by vaporizing oil or converting water into steam at bottom of well by application of heat to produce sufficient pressure to cause oil to flow up from bottom of well.

EQUALIZING MECHANISM FOR AIR COMPRESSORS.—No. 782,597; E. Cheshire, Milwaukee, Wis.



In two-cylinder air compressor, combination with two cylinders, their pistons, and means for concurrently moving pistons in opposite directions, of a port connecting clearance spaces in cylinders, valve in port, and means for moving valve so as to temporarily open it just as each piston is about to terminate its compression stroke.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The December, 1904, report for the mines at Treadwell, Douglas Island, shows that the Alaska-Mexican 120-stamp mill ran 294 days; crushed 18,307 tons of ore; estimated realizable value, \$25,571; saved 312 tons sulphurets; estimated realizable value, \$22,014; working expenses, \$32,159. The Ready Bullion 120-stamp mill of the Alaska United ran 291 days; crushed 18,730 tons ore; estimated realizable value, \$24,138; saved 320 tons sulphurets; estimated realizable value, \$28,111; working expenses, \$31,206. The Alaska Treadwell 240-stamp mill ran 291 days; 300-stamp mill ran 27 days; crushed 78,256 tons ore; estimated realizable value, \$76,664; saved 1737 tons sulphurets; estimated realizable value, \$73,992; working expenses.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The work of changing the shaft timbers and placing in the guides for a cage at the Silver Thread, one of the properties of the Tombstone Con. Co., at Tombstone, has been completed and hoisting has commenced. The ore body recently uncovered on the 600-foot level is one of the largest discovered in that property for some time and was found below the old water level, showing that the mines of this district continue to go down. The ore is of high-grade silver containing considerable lead and good values in gold. At the big shaft of the company the work of exploration on the 800-foot level is under way. The pumping record averages 3,500,000 gallons a day and the shipments of ore continue the same.

Tombstone, Feb. 21.

#### Gila County.

(Special Correspondence).—The Old Dominion's smelting cost at its new plant, at Globe, is \$3.50 per ton as compared with between \$5 and \$6 at its old plant. Its mining cost, including extraordinary development work and expenses of its new shaft, is \$4.50 per ton as compared between \$6 and \$7 per ton. This reduction in costs with the high price for the metal permits of the treatment of 5% ore.

Globe, Feb. 20.

#### Martocopa County.

(Special Correspondence).—D. Cleberat is developing claims on the Hassayampa near Morristown. G. Hamlin reports the mill at the Relief mine closed down because of scarcity of fuel. The recent rains have made some of the desert roads almost impassable. E. H. Winters is working a gold property near Winters.

Phoenix, Feb. 20.

#### Mohave County.

(Special Correspondence).—There are twenty men on road work and in the mines of the German-American Co., near Vivian. This company is to put in a milling plant. The main shafts on two mines of the group are now down 200 feet and sinking is still being continued. Above these levels the mines have been thoroughly developed, showing bodies of milling ore.

Vivian, Feb. 19.

The Golden Gem M. Co. will build a mill on their property, near Cerbat, if sufficient water can be developed, otherwise they will build at Kingman or McConico. B. F. Hall represents the company. The Tub mine in Union basin, near Cerbat, is being developed by B. F. Hall. T. R. Garner, general manager of the St. Louis mine at Cerbat, will let a contract for 500 feet of drifting.

#### Santa Cruz County.

Near Jefferson Camp, C. O'Keefe and G. Wieland will resume work upon the Redmen mine. They have a tunnel in 100 feet on a copper ledge 4 feet wide and a 30-foot shaft below the tunnel level. G. Wieland is developing the Red Rock and Blue Rock.

#### Yavapai County.

(Special Correspondence).—The Anderson Metals Extraction Co. has commenced work on the foundations for eleven cement tanks at McCabe for its cyanide plant to work the tailings under royalty produced by the Model G. M. Co.'s mill. These tanks will be 43 feet in diameter and 4 feet high. There are 25,000 tons of these tailings. The company expects its machinery to arrive within the next sixty days from the East and hopes to be operating by May 15, running 100 tons a day. They have ten men at work on the plant.

McCabe, Feb. 20.

(Special Correspondence).—At the P'au mine, 8 miles south of Jerome, forty men are working and the mill construction will be completed by March 1. The ore is crushed by friction in a tube mill. A large cylinder is revolved horizontally and when partly filled with ore the rotation thereof grinds the mass into the finest kind of particles that can easily be plated and then cyanided.

Jerome, Feb. 21.

(Special Correspondence).—The Oro mine, near Minnehaha, has closed down because of lack of water, as for some time there has been hardly enough water at the Oro property to run ten tons of ore a day through the mill, which has a capacity of 150 tons. The main shaft of the Oro mine is down 555 feet and will be sunk deeper to develop water enough to operate the mill.

Minnehaha, Feb. 20.

### CALIFORNIA.

#### Butte County.

W. P. Hammon has returned from the East, where he arranged for the construction of seven more dredgers to operate in the Yuba river gold field, where the syndicate has two machines working and four under construction in the Yuba river tract. In addition the Marys-

ville Gold Dredging Co., John Martin's concern, has contracted for two dredgers of the same style. Each machine costs about \$90,000. While extracting the gold for the owners the tailings from the river bed are being thrown up to construct an immense barrier for the government across the channel of the Feather river. When they complete the contract the dredgers will continue mining operations behind the barrier, the latter being protected while it prevents a flow of debris down the river. The barrier is part of the great works planned by the government to prevent quantities of sand and gravel from flowing down Feather and Sacramento rivers, and when plans for it were made, dredger mining in the river was commenced. The government saves many dollars by this mode of construction. These dredgers are the largest in the world, being built to work gravel 60 feet below the surface or twice the depth worked elsewhere. The Hammon syndicate will also construct more dredgers at Oroville, two being contracted for recently.

#### Calaveras County.

It is reported that a 7-foot ore body has been struck at the Gwin mine. D. McClure is superintendent. The Hagerman gravel mine on the Calaveras river, near San Andreas, is being opened by D. P. Gray. D. A. Nunes, superintendent of the Nunes mine, near San Andreas, is running a bedrock tunnel to tap the gravel channel. A mill may be put up when the channel is struck. D. Fricot has bought a large whim for the Johnson mine at Canada hill. J. B. Luddy is superintendent.

At the Essex Con. mines, near Angels, the shaft is being unwatered and put in shape for reopening the lower levels. The 150-foot level in the shaft is being retimbered preparatory to development and stoping there, and the 250-foot level is being explored, and drills will be breaking ore there in a few days. The Allison tunnel has been explored by hand drills along the vein for 120 feet and found to warrant an air pipe line 4000 feet long, when power drills will be put to work at once. This pipe line, also passing through the Harrison tunnel portal, will be there tapped to supply drills there, when the present face will be extended across the formation about 50 feet to cut another vein west, which crops strongly on the surface. A tramway 1000 feet long has been surveyed and will be put in from the mine to the railway track, where a spur has been built. The 40-stamp mill is being overhauled and will start up in a few days. J. Meyers is manager, F. R. Crocker superintendent and E. C. Wood engineer.

#### El Dorado County.

The Witmer and Fuller mines, near Placerville, are being worked by T. Clark, superintendent of the River Hill mine. An air compressor will be put on the property, and the ground is being cleared for a hoist. At Greenwood the Oliver mine is down 300 feet and sinking with three shifts. The Santa Claus and Short Handle mines are being unwatered. A new pump has been put in the 90-foot shaft of the Cora Dora, near Grizzly Flat. Sinking has been started at the Bacon mine at Gold Hill.

#### Nevada County.

Superintendent A. D. Foote of the North Star mine, near Grass Valley, has added three tanks to the electric precipitation cyanide plant and is building others.

R. D. Jackson and D. R. Finlayson are building a 50-ton cyanide plant to treat the tailings from the Empire mine near Grass Valley.

#### Placer County.

The old Dardanelles tunnel is being worked by J. H. Myers and A. G. Read of Forest Hill. This mine was formerly worked by hydraulicking, and then, on the channel going into the divide, drift mining was started, until at a distance of 2400 feet a deep cross channel was found cutting through the main channel, but excessive water finally caused its abandonment. The present owners are continuing the old tunnel from the worked out channel on and through the cross channel. It is estimated that when in 800 feet the tunnel will encounter the continuation of the "white lead." The Paragon mine at Bath is being worked by W. Rhea of Forest Hill. At Last Chance, near Forest Hill, J. H. Myers and B. E. Caples are working the Bay State, and D. M. Ray has charge of the El Dorado Co.'s property. The Tadpole mine at Canada Hill will erect a mill with a capacity of sixty tons per day.

#### Shasta County.

A 4-stamp triple-discharge quartz mill has been put in on the Crown Point mines on Mule mountain, west of Redding, by G. P. W. Jenkins and operations at the mine have been resumed. The Crown Point is 1 mile from Larkin and 2 miles east of Clear creek. Electric power will be used to run the mill, the current being secured from the Northern California Power Co.'s line running to the Heintz dredger.

#### Siskiyou County.

Ladd & Patton, operating in the Big Bend district on South Fork, near Cecilville, are preparing to put in a small mill on their quartz property. The Salmon River M. Co. are working the Conzett hydraulic claim, near Cecilville, with two 6-inch giants. L. Monahan is superintendent of the Gold Dyke mine, near Cecilville, and is crushing good ore in the new Huntington mill. W. H. Young, superintendent of the King Solomon mine, will put a cyanide and milling plant on the mine as soon as a road can be built to Black Bear.

#### Trinity County.

At the Fairview mine, near Minersville, thirty stamps are dropping night and day on good ore. The quartz mill is run by water, the power being furnished by the company's new ditch from Stuart's Fork. The mine is equipped with an up-to-date electric plant which furnishes power for the saw mill, lighting and other mine purposes. A force is running a lower tunnel, which, when completed, will give 400 feet of backs. It is now in 600 feet. There are 135 men on the company's payroll. J. A. Brent, manager of the Quimby gold mine on Quimby creek, near Blue lake, will put a large force at

work, building the 9-stamp mill and work the property on a large scale.

#### Tuolumne County.

A gallows frame is being built at the Hard Times mine, near Arrastraville, and it is expected that the mine will soon be producing ore. The Star mine and mill, near Columbia, are running steadily with twenty-two men. The Clio mill at Jacksonville is being overhauled preparatory to starting up. The shaft of the Longfellow mine at Big Oak Flat has been sunk over 600 feet.

### COLORADO.

(Special Correspondence).—The Bureau of Mines in the State house at Denver opened the exhibit of minerals that was on display at the St. Louis Exposition. The independent oil producers of the State are organizing to secure legislation in favor of the independent companies and curbing the trust. An independent refinery is being talked of by the State. A bill is now before the Legislature proposing the building of a State refinery. It is understood the United Oil Co., an auxiliary of the Standard Oil trust, has recently cut the price of oil in this State, and the independents will try and improve conditions now existing throughout the State. The Federal Court at St. Louis has decided against the Venture Corporation of London in their suit against the Stratton estate for \$6,000,000 damages, claiming that the mine had been "salted."

Denver, Feb. 20.

#### Clear Creek County.

(Special Correspondence).—The mining industry in lower Clear Creek county shows an improvement over one year ago. The Independent Smelter, at Golden, has purchased the Kilton Sampling Works and made some improvements. They have added a new crusher and Vezin sampler. Since the starting of the smelter at Golden it is understood the trust has reduced the treatment charges on ore from this district to \$3. The Independent Co. say they will not meet the rate, but will only take such ore as they are able to make a profit on. It is understood the larger companies in the district have contracts with the trust and that most of the business now secured by the Independent plant is from the smaller producers. J. H. Kemp has charge of the sampler at Idaho Springs. On Chicago creek, 7 miles from Idaho Springs, the Honest John M. & T. Co., J. F. Puchert manager, has eighty-six claims. The tunnel which was started one year ago is now in 1100 feet. In the next 200 feet they expect to tap the Maryville or Dunbarton vein. At the 1100-foot point they struck a vein with a pay streak 18 inches wide and the mill dirt 5 feet in width. The property is equipped with compressor and drills. Later on they expect to put in a water power plant and electric apparatus. M. W. Tanner is manager. The Waltham M. & M. Co., at Idaho Springs, are working their 20-stamp mill on dirt from their own mine. The mill when completed will have a capacity of 100 tons daily. The cyanide plant will be 75x110 feet, steel frame building and contain six 100-ton steel tanks. The furnace room will be 36x36 feet. The incline shaft is down 140 feet. They are putting in an electric pump.

Idaho Springs, Feb. 20.

(Special Correspondence).—The Old Town mine, in Russell gulch, is supplying J. G. Roberts, proprietor of the Jackson mill, with seventy-five to eighty tons of ore per day. The new 20-stamp mill of the Hudson Reduction Co., on Chicago creek, has a capacity of seventy-five tons per day. They are running mainly on their own ores from the Shafter mine, controlled by the Shafter M. Co. They have a shaft down about 790 feet and have 2000 feet of drifting. A. H. Roller is manager. Pike & Co. have a lease on the Little Mattie and have been running a drift 300 feet. On Fall river, 1 mile from Clear creek, the Lucania T. M. & D. Co.'s tunnel is in 1900 feet. The object of the tunnel is to get into the Russell Gulch district in Gilpin county. When completed the tunnel will be used for transportation of ores. They have 5000 feet to go. J. McColl is manager. The slimes plant which was erected last year to handle the slimes from the Gem Extension concentrating mill, and which has been closed down for some time past, has been leased to Palmer, Hampson & Strang, who are overhauling it and expect to start up in a few weeks. A 21-foot tailings wheel is being added to the plant, which already contains two vanners, one slimer and one Wilfley. The Pittsburgh Con. M. Co., operating the Brighton mines, 1 mile above Freeland, will erect a concentrating mill this summer. A large amount of ore has been blocked out and recently a good strike was made in the 400-foot level. The incline shaft is down 500 feet. A drift is being run to connect with some of the old workings of the Freeland mine, which will give them drainage facilities and do away with pumping. The mill will be erected on Fall river. D. Ellis has charge.

Idaho Springs, Feb. 18.

(Special Correspondence).—The Monarch tunnel, being driven by the Freeland D. & T. Co., is now in 3500 feet and has 1600 feet farther to go before striking the Freeland district.

Dumont, Feb. 18.

(Special Correspondence).—D. Kennedy, owner of the Centennial mine, is developing the mine and retimbering some of the stopes. He is hoisting fifteen tons per day. The mill is being operated one shift. As soon as the creek opens up so that a supply of water can be had he will run the mill full force. The Capital M. & T. Co., W. Cooper manager, has completed 161 feet of new tunnel, which shortens the old tunnel 750 feet. The compressor plant on this property will be started about March 1 and will operate two drills to drive the main tunnel at right angles to the formation of Griffith mountain 320 feet farther. With this tunnel it is expected to cut the Colorado Central belt at a depth of 250 feet below the Colorado Central present workings. It will make the depth of the tunnel 1650 feet below the apex of the mountain.

Georgetown, Feb. 18.

(Special Correspondence).—Work on the new mill of the Dives-Pelican is progressing as rapidly as weather will permit. The management expect to have the mill



in operation by the first of May. The new Rand compressor has recently been installed and is now furnishing air to the mine.

Silver Plume, Feb. 18.

W. Ballantyne is working the Silver Mountain and Ben Franklin lodes at Empire for the Benzie Investment Co. The work is carried on through the Empress tunnel of the Empire Tunnel Co.—Nelson & Co. are working the Silver Mountain vein.—The Silver Mountain mill at Empire is treating ore from the Benton mine at North Empire, worked by Bishop & Heckman, and the Mint lode at Empire, worked by P. Bue & Co.

#### Glipin County.

The 700-foot shaft being sunk by the Cashier G. M. & R. Co. on the Pittsburgh-Golden Wedge group, near Russell, is down 660 feet. B. L. Campbell is manager.—The Money Metal M. & Co. have taken a bond and lease on the Claudia J. and Millie B. lode claims, near Tip Top, in the Hawkeye district, from W. H. Kelley and M. Whalen. It is reported that they will put in an air compressor and a steam hoist.—L. J. Mountz has charge of the work on the Cronje and Cyrene claims, near Twelve Mile, in the Pine Creek district.

#### Gunnison County.

It is reported that the Maple Leaf M. Co., near Sillsville, will build a mill. The shaft has followed the vein down 300 feet and is to be sunk deeper. Heavier hoisting machinery is to be put in.

#### Jefferson County.

S. Guggenheim has presented the Colorado School of Mines at Golden with \$50,000 in cash for the erection of a hall of administration.

#### Lake County.

(Special Correspondence).—A new mill is to be built at the mouth of the Yak tunnel, near Leadville. The mill will be a reduction and concentration plant with a capacity of 200 tons a day.—The Murphy shaft on Rock hill is down over 400 feet.—Work has been resumed on the Triumph mine, on the east of Jonny hill, near Leadville.—Two of the six proposed new shafts on the western slope of Rock hill will be started by March 15. One will go down on the Parson, under the direction of F. H. Minard, and the other will be on either the Frank or the north half of the Mike, under the management of R. B. Stanton. Both shafts will go to the blue lime, or to 1000 feet.

Leadville, Feb. 21.

#### San Juan County.

The Detroit & Colorado M. Co.'s property on Sultan mountain, near Silverton, has been closed down for a time. L. L. Haines is manager.

#### Summit County.

The Lucky and Mineral Belt group, near Breckenridge, are being worked by the Beaver Creek G. M. Co., F. A. Yauger manager.—At Frisco the Copper Queen management is considering the erection of a concentration mill, near the Colorado & Southern track, and has started a new tunnel to cut the vein at greater depth. The new tunnel is so planned that ore from it could be run in the mine cars directly to the mill, in case the company decided to build it. It is expected that the tunnel will crosscut the vein, which it will follow, at about 200 feet from its mouth.—The Summit County Mining Exchange has been formed by A. E. Keables of Breckenridge to buy and sell mines in Summit county. D. H. Lawrence is examining and reporting engineer.

### IDAHO.

#### Cassia County.

R. N. Bell reports that the Sweetser-Burroughs M. Co., G. T. Burroughs, Jr., manager, has been dredging the Idaho river 30 miles southwest of Minidoka for ten years, with a suction dredge with a 10-inch nozzle. The hull is 30x90 feet, draws 3 feet of water and is handling 2500 cubic yards daily. A 125 H. P. vertical compound condensing marine engine supplies the power. From the suction the gravel is discharged into a 12-foot stationary sluice, set nearly horizontal, to check the velocity of the stream. From here it passes to two lengths of shaking sluices set at a grade of 1½ inch per foot. The sluices are 17½ feet long and 5 feet wide, shaking endways, with a 3-inch stroke. The bottoms are perforated steel plates, with ¾-inch holes ¾ inch apart. The coarse material passes to a rubber belt conveyor, which stacks it astern. The fine material with the gold is discharged into a distributing box, which feeds it to a set of sixteen inclined burlap tables set at right angles to the sluices and having an area of 1000 square feet, discharging over the side of the boat. The State Inspector of Mines reports that the operation is continuous and uninterrupted by the necessity of cleaning up, moving anchor lines, changing spuds, etc. The burlaps are taken up each shift and washed in a wooden tank, from which the accumulated gold and black sand are elevated automatically to the amalgamating room, where the gold is separated by barrel amalgamation. Wyoming coal has been used; but the company is experimenting with sagebrush, grubbed out by horse power and cut up with a bark mill for convenience in firing. The cost of handling gravel, including all charges, is 4½ cents per cubic yard.

#### Elmore County.

The Middle Boise placer claim, 14 miles from Rocky Bar, will be worked by H. D. Roberts with twenty men in the spring.—The Henry Clay mine, near Rocky Bar, is being worked by W. J. Bogard and R. Y. Bogard.—The Okobojia Placer M. Co., W. H. McNutt manager, will start work in the spring in the south end of Rocky Bar.—W. A. Nixon is developing the Commonwealth Hill mine, near Rocky Bar.

N. D. McLeod is working the Golden Cloud Con. mine, at Rocky Bar.—The Elmore mine is to be worked by I. E. Rockwell, of Bellevue.

#### Idaho County.

The Albertas claims, 3 miles south of Elk City, are to be worked by the Elk G. M. & M. Co., after being idle since last fall. J. A. McEachran is manager.—The Concord M. Co. at Hump is working fifteen men on the

Mother Lode No. 2, and has sunk the new Concord shaft 185 feet.—The Atlas Co., working west of the Concord, intends to sink 200 feet farther. R. C. Bishop is superintendent.—M. Dobbins is working the Lost Lake at Hump.

It is reported that the owners of the Little Giant mine, near Warren, will increase the milling capacity and put in an electric power plant. The mine now has a 5-stamp mill.—J. J. Jewell has charge of the Mayflower mine, near Warren.

#### Shoshone County.

The Montana-Idaho Summit M. Co. are working the Black Horse, 6 miles from Murray, and expect to ship lead ores. C. W. Betts and C. Manley have charge.

Although the operation of concentrators of the Cœur d'Alenes was interfered with by the inclement weather during January, the output amounted to 21,500 tons. The Bunker Hill & Sullivan shipped 5500 tons of concentrates and crude ores to the smelters. There was a slump in the output from the Morning mine at Mullan, due to the cold weather and the resulting inadequacy of the water supply, the output being 1500 tons. The loss in the production of the Morning is equalized by the copper shipments from the Snowstorm at Mullan, as 3800 tons were shipped to the Tacoma and the Anaconda smelters. The Federal M. & S. Co.'s Mace mines, the Standard and the Mammoth, produced 3500 tons of concentrates; the Tiger-Poorman 1500 and the Last Chance, at Wardner, 3000.

### ILLINOIS.

#### Jo Daviess County.

In a recent publication of the U. S. Geological Survey, H. F. Bain says that in the summer of 1903 there were in northern Illinois fifteen places at which mining or prospecting was being carried on vigorously. The Waters mine, at Galena, was for some time under bond to the Grant Reduction Works, which sunk several shafts, put up a concentrating mill and shipped about eighty tons of zinc ore before forfeiting the bond. The main output has been zinc ore. In earlier years galena was taken from this crevice, but the amount is not known.—The Little Corporal mine is one of the best equipped in the district and is making regular shipments of ore. The plant consists of an 80-ton concentrating mill, a crosshead pump, hoist, air compressor and two drills, the whole driven by gasoline power. The present workings are connected with the surface by a shaft 110 feet deep. At the time the mine was visited the lower drift was 400 feet long. The opening varies from 8 to 12 feet in height, being closed usually by a firm cap rock in which the crevice is marked by a mere line. In places it could be seen that above the timbering there were chimneys connected with the opening. The drift varied in width from 6 to 16 feet. The predominant ore mineral is blende, very little galena or carbonate being present. The present work is 20 feet below the plane of permanent water, but is within the zone of oxidation, as shown by the brown color of the rock and sand. The usual thin film of iron sulphide occurs between the blende and the rock, and occasionally large crystals of pyrite occur. For this region, however, the ore is unusually free from iron sulphide. The concentrates are said to run from 50% to 60% in zinc and 2% to 4% in iron. The tailings are unusually clean and the ore does not need roasting and cleaning. As many as fourteen tons of concentrates are said to have been produced in a single mill shift. The mill started in July, 1903, and has run more or less steadily since. The flow of water is steady, but the amount is not known. In Vinegar Hill township there are many old workings and the area has produced a large amount of lead. Efforts have been made to reopen several of these mines, among which is the Vinegar Hill mine. This is in a small ravine running into Galena river, the top of the shaft being 33 feet below the base of the shale. The crevice runs east-west and has yielded galena at a depth of 29 feet. A new shaft is being sunk and a drift is being run to the east 10 feet below the old workings. A gasoline engine for power was in operation when the plant was visited. At the Fox River Valley mine the old workings on an east-west crevice are being reopened. Two shafts, one 95 feet and the other 65 feet, are open. Both galena and blende have been found in small quantity. The Oldenburg mine, near Galena, was not open in the summer of 1903. There are two shafts, the lower 100 feet and the upper 140 feet deep. This mine is along an east and west crevice, or, rather, along two nearly parallel crevices, which unite toward the eastern part of the mine. The ore body is in a vertical sheet and is an example of the honeycomb deposits. The thickness of the sheet varies from almost nothing up to about 30 feet and has been mined for about 800 feet in an east and west direction. A small amount of lead is present. Where small north and south crevices cross the main crevice there are usually larger and richer deposits of ore. The mine of the Northwestern Lead & Zinc Co. is near the Wisconsin boundary, not far from the Chicago & Northwestern Railway. The mine, which was visited in the summer of 1904, was developed in the preceding winter. The shaft, which is 92 feet deep, is at the base of the slope at the head of a small tributary of the Galena river. The workings extend east and west for nearly 200 feet. The ore consists of thin sheets of blende developed along the partings of the rock and minor amounts of breccia found in connection with some northward-pitching fractures. Very little iron pyrite shows in the mine. The workings are below water level, though oxidation extends down almost to them. There is a new and well-equipped mill on the property. The California, or Sand Prairie mine, is being opened by the Royal M. Co., near the Mississippi river, at the extreme southern edge of the district, in a small ravine. In the vicinity are a number of old lead diggings, which were formerly worked by long adits driven in from the edge of the bluff. These mines were the scene of great activity from 1849 to 1855, and at that time acquired the name of California diggings. The Royal M. Co. has three shafts on an east-west crevice about half way up the slope of the ravine which parallels the vein. The Wishon mine, north of Elizabeth, was an important producer of lead about 1865. In 1902 the old workings were reopened in a search for zinc and a new shaft was sunk 145 to 150 feet in depth. This was closed

at the time the place was visited. The workings are developed along an important east-west crevice marked by old shafts for a distance of a mile along its course. The ground shows thorough oxidation, and galena was the only mineral seen. It occurs in small pieces in tight crevices, the remaining ore evidently having been removed. The Apple River mine is north of Elizabeth on a crevice which has been an important producer of lead. In the summer of 1903 an old shaft was being pumped out, but the workings were not sufficiently advanced to permit of any examination. The Skene mine in 1904 was reopened by the Elizabeth M. & M. Co. It is on a crevice running N. 83° E. It shows well-defined pitches to the north and south at a depth of 96 feet. The mine has been developed about 1200 feet along the south pitch, with crosscuts to the north. The work is below present water level, but is entirely in oxidized ground. The ore consists of nearly clean galena. Minor amounts of pyrite are found, both as the usual film separating the galena from the rock and in distinct balls and crystals. No carbonate of zinc occurs and only a very few small pieces of blende. The ore is mainly in the south pitch, but numerous small flats and verticals run off into the core between the pitches, and possibly the whole of the core may be mined. There is no evidence that the galena in this case is a secondary concentration, and the amount of it, if it be original, is notable. Between May and August over 600,000 pounds were shipped without any cleaning facilities other than hand jigs. The Queen mine is near Elizabeth. The Vista Grande is a small lead mine near Scales Mound with a shaft 115 feet deep. The Peru, or Black Jack, is a well-equipped property, not now in operation. Between the years 1876 and 1882 it was a steady producer, shipping ore regularly to the Illinois Zinc Co., with which its owners were affiliated. Recently a new mill was erected, and the mine was pumped out and examined preparatory to resuming work; but apparently the ore reserves were unsatisfactory, as the plant has been closed down. The superintendent is H. Ragge. The ore is blende, occurring intimately mixed with iron sulphide. Near the top of the workings, 45 feet below the surface, cubes of galena ¾ inch in size were found plentifully sprinkled over the blende. The ore occurs in thin sheets in the pitches and in flats along bedding planes.

### MISSOURI.

#### Jasper County.

(Special Correspondence).—The Hazel M. Co. of Webb City is making improvements in their property and will put in a new boiler, steam hoister and pump.—J. W. Brooks & Co. of Joplin, working the Schifferdecker land at Chitwood, have opened up a good mine at 145 feet, and will begin putting up a new 100-ton mill this spring.—Luke & Brown of Alba have a lease on eighty acres of mineral land and will commence prospecting by drilling.—The General Lead & Zinc Co. of Webb City, owning forty acres of land near Carterville, will build a new 100-ton mill this spring. A fine body of ore has been developed at a depth of 160 feet.—Holmes, Cape & Rodgers M. Co. of Joplin will build a new 100-ton mill on their 120-acre lease at Badger as soon as the weather will permit.—Mitchell & Huffman of Galena have opened up a good prospect on the Galena Lead & Zinc Co.'s ground near Galena.—The Bullfrog mine, near Joplin, owned by the Mattes Bros. of Joplin, has been sold to a Rochester, N. Y., syndicate for \$75,000. The property will be managed by C. E. Hart of Joplin.—The Hancock M. Co. of Joplin has struck a body of ore by drilling on the Murphy land southeast of this city. A mill will be erected upon the completion of the shaft. A. T. Bragg of Tuscola, Ill., and J. E. Hancock of Hamilton, Ohio, are interested.—C. Mauby and J. Jones have struck zinc ore in sinking a shaft on the Kiheka tract southwest of Carthage. Silicate was struck at 2 feet and was found continuously to a depth of 58 feet, when a good body of zinc ore was struck.—A new \$12,000 mill, built by the American Zinc, Lead & Smelting Co. of Webb City, is nearly completed on the forty acres of land north of the Get There lease near Carterville.

Joplin, Feb. 19.

### MONTANA.

#### Flathead County.

M. Downey has charge of the work on the North-western claim on Callahan creek, 3 miles from Troy. A compressor has been put on the property and a shaft will be sunk with air drills.—It is reported that Larson & Greenough will put a compressor and other mining machinery on the B. & B., near Troy.—The Rustler M. Co. is working the Snowshoe mine, 18 miles south of Libby. They have bought the Chinook from J. Z. Clark and F. Wegner.—P. J. Brophy, J. O'Rourke, D. J. Hennessy, A. J. Campbell, T. M. Hodgins, M. Finlan and T. J. Walsh have formed the Libby Placer M. Co. at Lewiston and taken over the Howard placers, 25 miles south of Libby. In the preliminary work of acquiring water rights, perfecting titles and prospecting, they have expended \$40,000. The water from five creeks will be used in washing the gravel, and the plant is equipped with a water power derrick for handling big boulders.

#### Granite County.

D. T. Conkling is superintending the driving of a tunnel to reach bedrock on placer mines on Stony creek, 16 miles west of Phillipsburg. H. Kaiser of Phillipsburg is interested.

#### Lewis and Clark County.

Thirty stamps began dropping at the Bald Butte mine, near Helena, on February 15. J. Edgerton is secretary-treasurer at Helena.

#### Madison County.

C. E. Lentz, president of the Lentz Gold, Copper & Silver M. & R. Co., 7 miles south of Bear gulch, says that the mine is developed by 400 feet of tunnel and 200 feet of upraises. They expect to put up a hoisting engine, as they intend to sink a shaft.—It is reported that the Watseca, Bonanza and Champion mines at Rochester are to be worked through a new 1000-foot shaft to be sunk on the Bonanza. The 600-foot shaft on the Watseca will be unwatered if it is not drained by the new shaft.



## NEVADA.

## Esmeralda County.

C. A. Montgomery is to build a mill at Beatty's, on the Amargosa river.—The old Amargosa mine, which was a shipper in the '60s, is to be reopened and a new mill put in.—H. L. Frank of Butte, Mont., who has mining interests in Goldfield, is preparing to put in a mill capable of handling 250 tons daily.

The reduction plant built by the Goldfield Reduction Co., at Goldfield, is nearly completed and stamps will be dropping in two weeks. All of the machinery for the mill is on the ground and will be installed. There will be ten 1240-pound stamps put in at first, giving a capacity of thirty tons daily. Later a complete cyanide plant is to be added to the equipment and as conditions warrant the capacity of the mill will be increased. M. C. Gardner, Jr., is in charge. It is reported that H. L. Frank of Butte, Mont., will build a 40-stamp mill at Goldfield. G. R. Potter is manager, and F. Enzensperger superintendent of construction.

The railroad fare from Reno to Tonopah is \$17.15; the stage fare from Tonopah to Goldfield is \$4; automobile fare from Tonopah to Goldfield is \$6; hauling by mule team, Tonopah to Goldfield, per ton, \$20; furnished rooms in adobe houses, \$1.50 per day for one person, \$2 for two if they occupy one bed; miners, \$4 to \$4.50 a day; laborers, \$4 a day; cooks, \$6 a day and board; printers, \$4.50 a day; carpenters, \$6 a day. Goldfield is in a mountainous desert 45 miles from the California line, at an altitude of 5000 feet. Hay sells at \$55 a ton; lumber, \$70 per thousand feet; kindling wood \$18 per cord; kerosene, 60 cents a gallon; fresh milk, 25 cents a quart; sugar, 10 cents a pound; hoots blacked, 25 cents; the MINING AND SCIENTIFIC PRESS 25 cents per copy.

## Lincoln County.

The Bamberger-De Lamar M. Co. at De Lamar, F. P. Swindler superintendent, will add a new 750-ton slimes plant to the present mill equipment. At the mills is a large tailings dump which contains values worth saving, and it is the intention to work them over. This dump was formed when De Lamar operated the dry process mill.

The Black Hawk M. Co. has started work on the Buster mine at Searchlight. They will put up a 10-stamp mill when they have made provision for a sufficient water supply. Two 85-foot shafts have been sunk. C. E. L. Gresh has charge at Searchlight.—A. M. Jones and C. Anderson have bonded the Sazerac and Winona claims at Dupont from G. H. Hamstadt of Manvel.

## Nye County.

J. Griffin and H. Cutting have sold the Utopia mine at Lone Mountain to the Anglo-Nevada M. Co.—In his report to the Montana-Tonopah M. Co., working the Rye Patch plant at Tonopah, Manager D. B. Gilles recommends that a double-drum hoisting engine be purchased and that the ore bin capacity be enlarged.

O. S. Swanson of Spokane, Wash., and C. H. Huber of the Coeur d'Alenes, Idaho, have bonded the Hummer claim near Tonopah, Nevada, for \$25,000.

Regarding the Kawich district, E. W. Tremont of the Eureka Prospecting Co. says, in the Eureka Sentinel, that Goldreed is on the east side of the Kawich range, 40 miles south of Reville, and 180 miles south of Eureka. There are several large quartz ledges cutting the porphyry formation. The trend of the ledges is northwest and southeast, dipping to the east, but not enough development work has been done to show the actual dip. The ledges run through the range for 4 miles to Nixon on the west side. The Goldreed M. Co.'s group comprise 26 claims, and 322 claims have been recorded, while there are probably as many more that had not been put on record. The deepest hole in camp is the Discovery shaft, which the company has sunk 50 feet and is now crosscutting on the ledge. The outcroppings are strong and well defined, and in some places carry high values in free gold. Development work has been retarded by lack of water. On the discovery of water the immediate future of the camp depends, although work will be prosecuted even if water has to be hauled in wagons until development justifies pipelined water from a distance. Several are sinking wells in different places.—A. Dees of Eureka and J. Walters of Huntington are partners in a well 12 miles east of Goldreed, and they struck water at 7 or 8 feet, but are going deeper. Many miners are working on leases from the Goldreed Co. Each lease comprises 150 square feet. The company reserves every alternate lease, in addition to 600 square feet surrounding the Discovery shaft. The life of a lease is 9 months, with the privilege of prospecting for 30 days. At any time within 30 days a lease may be thrown up and another one taken. If, however, at the end of 30 days a man decides to hold his lease, his contract is good for 8 months longer. The terms run from 20% royalty on \$100 ore to 40% on \$750 ore and up. The town of Goldreed has laid out has three principal streets and several cross streets. All the houses are canvas. There are 2 restaurants, 2 lodging houses, 8 saloons and 1 store. Meals are 75 cents and up; cots \$1.50 a night; water \$6 a barrel, and cedar wood \$20 a cord. The health of the camp is good. The climate is very similar to Eureka, but there is not so much snow. Miner's law prevails, and at a recent meeting of the miners wages were fixed at \$4.50 for eight-hour shifts. It was decided that no Japanese or Chinamen be allowed in Kawich. Goldreed may be reached by way of Eureka: Eureka to Fish creek 18 miles, Fish creek to Willow creek 20 miles, Willow creek to Hicks' 15 miles, Hicks' to Moore's 16 miles, Moore's to Hot creek 18 miles, Hot creek to Tybo 12 miles, Tybo to Reville 40 miles, Reville to Goldreed 40 miles. Total 179. One may go from Hot creek to Warm springs (15 miles south of Tybo) and then to Reville mill (12 miles west of Reville) and shorten the distance 12 miles by cutting out Tybo and Reville. There is water at all the above stations, hut meals, and hay and grain may be had only at Fish creek, Willow creek and Hot creek.

## Washoe County.

The Salt Lake & Reno M. & M. Co., J. W. Stolly manager, is developing a gold property 10 miles north of Peavine, north of Reno.

## NEW MEXICO.

## Grant County.

The machinery for the Century Co. has been all placed on its claims in the Lordsburg district by Wm. Davis. The shaft on the principal claim is being enlarged and timbered. After that work is completed the shaft will be sunk deeper. Water for the plant is being pumped out of the shaft.

## OREGON.

According to the United States Geological Survey reports, the mineral output of Oregon for 1903 was:

Gold	\$1,412,208
Brick and tile	425,544
Mineral waters	357,559
Coal (bituminous)	221,031
Quarry products	138,007
Gas	89,305
Silver	62,211
Gas coke	18,896
Coal tar	5,040
Platinum (110 ounce)	2,080
Copper	1,930

Total \$2,723,930

Lead (with South Dakota, Texas and Alaska)	\$ 149,566
Borax (with California and Nevada)	601,400
Raw clay products—kaolin and ball clay (with Arizona, Connecticut, Iowa, Maryland, Massachusetts, Michigan, New Hampshire, North Carolina, North Dakota, Utah, Virginia and Tennessee)	124,602

Total \$ 935,568

Ammonia (with Colorado and Washington), pounds	211,465
Steel (with Michigan, Missouri, Wisconsin, Minnesota, Colorado and California), long tons	236,891

## Baker County.

The Indiana copper property, 20 miles from Baker City, is being developed by F. W. Messner Sr., who has his shaft down 320 feet and is drifting on three levels.

Two rapid drop stamp mills are to be put in the Oro Fino mine, near Greenhorn.—W. L. Vinson has put in concentrators to save the black sand and fine gold at his placers at North Fork.—The Daines M. Co., over the hill from the I X L, are prospecting the Belcher vein. F. Daines has charge.

Manager Kelly, of the I X L mine, near Greenhorn, intends to stop underground work for a time because of the light pumping capacity of the plant, it being insufficient to handle the water. The company may be reorganized and may put in a sinking plant.

## Douglas County.

C. C. Mathews, superintendent of the Oregon Securities Co., in the Bohemia district, reports that driving on the Champion vein is progressing rapidly, and that the ore encountered continues to improve. The mill was started, but the ice formed on the concentrates and it was closed down until the weather moderates.

## Lane County.

The 40-stamp quartz mill at the Lucky Boy mine, at Blue River, has been closed down and will remain closed for several weeks on account of the fire. L. Zimmerman, president of the Lucky Boy M. Co., who was at the mines at the time of the fire, left immediately for Portland to replace the machinery.

## Grant County.

N. Berkeley may build a mill on the Buffalo-Monitor mine near Granite.

## Josephine County.

The Grants Pass Miners' Association intends to oil the 45 miles of wagon road between Grants Pass and the Waldo copper mines. Under existing conditions the road is impassable to loaded wagons during the winter months, and, as a result, the smelter can not be operated except in summer, when the hauling in of coke can be done on a scale sufficient to keep the plant running.

C. D. Crane, manager of the Lucky Queen mine at Winona, reports that the new 10-stamp mill is almost completed. It will be run by a 15-inch water wheel under a head of 31½ feet, from a ditch from Jump-off-Joe and Shorthorn creeks. It is intended to have the mill running by March 1. In the mine 2000 feet of tunnels have been run, blocking out considerable ore, which will be hauled 1 mile to the mill in wagons until the aerial tramway is completed. The postoffice will be discontinued on February 28, being superseded by the rural mail service on February 15 on the route from Grants Pass by way of the Jump-off-Joe valley.—It is reported that E. F. Terry will equip the Carr & Ferry placer on Silver creek, near Grants Pass, with hydraulic machinery.—A. H. Gunnell and H. E. Foster may build a 10-stamp mill on the Oregon Belle mine, near Jacksonville. Plans and an estimate have been prepared by F. E. Willett of Grants Pass, who recently completed the mill at the Opp mine.—The Enterprise M. Co. has started work on the Homestake mine, ½ mile north of Woodville, under the superintendence of F. Trowbridge, formerly with the Elkhorn mine, near Baker City. He will put in electric power so soon as the Gold Ray and Grants Pass electric line is completed.

## SOUTH DAKOTA.

## Lawrence County.

The Victoria M. & M. Co., G. S. Jackson of Deadwood manager, has started grading for their new mill and cyanide plant at Maurice station on the Spearfish branch of the Burlington road.—The Mainstay M. Co. at Keystone has completed the foundations for the vats of the cyanide plant to treat the product from its 30-stamp mill.—The Lucky Strike G. M. Co. has completed its payment on its properties in southern Lawrence county. C. A. Allen of Deadwood is manager.—The Golden Elk M. Co., working in the Nigger Hill district on the boundary line between South Dakota and Wyoming, will put in an air compressor and a sawmill. E. B. Sager of Deadwood is president and F. E. Wharton of Lead secretary.—At the annual meeting of the Black Hills Anaconda M. & M. Co., W. F. Cochran was elected president, C. C. Mourisse vice-president, J. Donaldson secretary and W. W. Steinmetz treasurer, all of Chicago, Ill. G. A. Karr, general manager at Hill City, was instructed to negotiate for hoisting machinery. The

property of the company consists of a large acreage in Central Hills. Development has been going on for over a year.

C. W. Merrill, metallurgist of the Homestake M. Co. at Deadwood, stated before the meeting of the Black Hills Mining Men's Association that the cost of crushing ore in the Amicus mill (240 stamps) was 18 cents per ton. The fineness crushed to is equivalent to 35 mesh, a slot screen being in use. Sizing tests show the pulp to consist of: 28% coarser than 100 mesh, 18% between 100 and 200 mesh, and 54% finer than 200 mesh.

## Pendleton County.

F. Herbert, president of the Clara Belle M. Co., working the Clara Belle mine near Oreville, intends to sink a new shaft, as the present one is out of line and unsafe because of caves in adjacent stopes. The Clara Belle has a 10-foot fissure vein in well-defined walls in the slate. The two stamps of the Tremain mill are crushing ten tons of free milling ore per day.

## Custer County.

The Hartford mine, near Custer, owned by C. C. Cray, J. C. Spencer and C. W. Carpenter estate, is to be cleaned out, the shaft retimbered and the property put in shape.—The Leroy G. M. & M. Co., near Custer, has struck good ore in a drift from the shaft at 90 feet depth. Samples of the ore were sent to the Omaha & Grant smelter, giving returns up to \$118 in gold per ton. The vein is 3½ feet wide. The ore is being stoped and will be shipped as soon as a carload is broken. F. H. Cook, president, has made arrangements for the treatment of a carload at the smelter in Omaha.

## UTAH.

## Plute County.

H. C. Lawrence, manager of the Sevier Con. mine near Kimberley, says that the mill is handling fifty tons a day and the loss in the tailings does not exceed .002 of an ounce in gold or .22 of an ounce in silver. The ore treated carries \$16 to the ton. About 25% of the gold is saved on the copper plates, while the balance is extracted by cyanide. Forty men are at work.

## Salt Lake County.

The Bingham Con. M. Co. will reduce the shipment of ores from its own mines to make room at the smelter for 200 tons of ore daily from the Boston Consolidated property, and also for concentrates from the Newhouse Mines & Smelters Co., whose mill is ready to begin. The Bingham's Commercial mine yields ores which contain satisfactory copper-gold-silver values and an excess of iron, and the management feels that this ore will be sought for its fluxing qualities. When sufficient iron can be obtained from custom ores to make a proper smelter charge it is to be expected that the commercial shipments will be reduced, and that the mine may be closed down for brief periods. The development work of the past two or three years has blocked out a large tonnage of ores in the Daltou & Lark, Miner's Dream and Brooklyn mines, and of late a considerable proportion of the company's output has come from these properties. In view of the fact, however, that the Mascotte tunnel, now being driven by the company, will cut under these mines, several hundred feet below their deepest workings, six months to a year hence, and provide an avenue through which their ore can be extracted at a saving of \$1 per ton, it is naturally preferred not to draw heavily on their resources until this tunnel is completed.—H. M. Adkinson, manager of the New England Gold & Copper Co.'s mines at Bingham, reports that the crushing capacity of the mill is to be increased and equipment added that will double the capacity of the plant, or up to fifty tons a day.—Manager H. S. Joseph of the Silver Shield mine of Bingham recommends that the company erect a concentrating plant in the spring to handle the milling ore and put it into a commercial product.

## WASHINGTON.

## Chelan County.

C. Rubin, superintendent of the Crown Point M. Co., at the head of Railroad creek, 18 miles from Lake Chelan, reports that the vein carries molybdenum, gold and copper, also vanadium.

A number of copper properties around Lake Chelan, Chelan P. O., promise well. A 600-foot shaft has been sunk on the Holden and drifts have been run at each 100-foot level. A 15-mile railroad has been completed from the lake to the mine and a matte smelter is being put up on the lake. H. G. Stilwell is developing the Grand View, adjoining the Holden property.

## Ferry County.

Manager A. I. Goodell has started the third furnace at Northport to handle the increased tonnage being received. The Mountain Lion, at Republic, is shipping fifty tons weekly, having contracted for the treatment of 200 tons; the First Thought mine, at Orient, is shipping seventy-five tons per week, and the Copper King, near Chewelah, is sending a car each week.—H. Young, manager at the Fortune Group M. Co., near Orient, has started work at the mine and says that the shaft on the Fortune claim, which is now 40 feet deep, will be continued down to the 100-foot level, when the ledge will be crosscut. The ledge is between serpentine and granite. The Fortune has shortened the distance to its mine by building a road connecting with the Sand creek road and thence down to Rockett.

## Skagit County.

A company has been formed by H. N. Anderson, Aberdeen, Chehalis county, president; A. S. Austin, Aberdeen, vice-president; W. W. Butler, secretary; I. M. Anderson, Aberdeen, treasurer; E. C. Miller, Seattle, general manager, to manufacture Portland cement at Cement City, on the Great Northern Railway, in Skagit county, where a townsite is being platted. The plant is to have a capacity of 1200 barrels per day, and is to be run by water and electric power from the Skagit river.

## Snohomish County.

The Monte Cristo and other mines shipping arsenical



ores to the smelter of the American S. & R. Co. at Everett have demanded pay for the arsenic in the ores, but have been refused. There is talk of the larger shippers building a furnace near their properties to roast the arsenic out before shipping to the smelter. The smelter is said to be shipping 200 tons of arsenic monthly. The arsenic ores treated at this plant are mainly arsenopyrite, containing about 14% of arsenic, 0.7 ounce of gold and 3 ounces silver per ton. The by-product plant for the condensation and collection of the white arsenic consists of a long brick flue, 20 feet high, connecting the Wetley mechanical six-hearth sixty-ton roasting furnace with the dust chamber, which is 5 feet high, and covers an area of 125x150 feet. This chamber is built of 4-inch brick walls and is divided into four parts, so arranged that by the use of dampers any one section can be cut off from the other and the condensation carried on continuously. The arsenical compounds in the ores are decomposed during the roasting, and are transformed chiefly into volatile arsenious oxide which is condensed from the fumes.

#### Stevens County.

The Last Chance mine, on Deep creek, near Republic, has been bought for \$43,000 by L. P. Larsen of Northport, who has sold it to the Jupiter Lead Co. of Joplin, Mo.

### WYOMING.

#### Carbon County.

The Cascade Copper Co. has resumed work on its tunnel, near Grand Encampment, under the superintendence of W. Suttingham. He will start drifting on the ore from the bottom of the 100 foot shaft. The two-compartment shaft of the Blanche C. M. Co. has been sunk 140 feet and will be sunk to a depth of 200 feet before drifting is started. A. H. Crow is superintendent.

The Anchoria mine, near Dillon, is to be equipped with a 40 H. P. boiler, a 6x8 hoisting engine, ore buckets, a No. 6 Cameron pump, wire cable, steam drill, ore cars, tracks and blacksmith shop.

#### Utah County.

The Pittsburg-Salt Lake Oil Co., A. V. Taylor of Salt Lake City, Utah, manager, will build an oil refinery at Spring Valley with a capacity of 1000 barrels a day. Of seven wells that have been sunk by the company five are producing at the rate of 1000 barrels per day. Plans have been made for putting up a 35,000-barrel capacity tank. The company expect to sink twenty wells. Analysis has shown the Spring Valley petroleum to contain 27% gasoline and benzene, 25% kerosene (water-white 45° B., 145° flash, 172° fire), 7% signal and headlight, and 41% lubricating stock carrying 18% paraffine. The crude oil is light green in color.

### FOREIGN.

#### AUSTRALIA.

##### Queensland.

At the Mount Morgan mine prospecting by diamond drills is being pushed ahead, and the overburden is being rapidly removed by the steam shovel. The new underlie shaft has reached a depth of 174 feet. The country is improving slightly as depth is attained, but great care has still to be exercised in timbering, etc. The shaft has penetrated the Luda workings. The excavations for the new smelters are well advanced, and the erection of the brickwork will soon be under way. These excavations will encroach on the site of the small water jacket, until recently in commission as a scavenger and experimental furnace, and smelting operations have been stopped and the furnace will be taken down. The returns from the Mount Morgan mine show the output of gold from ore chlorinated during December was 12,498 oz. 12 dwt. from 16,713 tons of ore treated. This increased average yield is partly due to gold recovered by a general cleaning up and partly to some richer ores recently uncovered by the steam shovel having been sent to the works for treatment. During the month 20 tons 4 cwt. of copper precipitates were collected. These precipitates are of slightly lower grade than usual, the 20 tons 4 cwt. only representing 14 tons 15 cwt. of metal. The smelter, which only ran for a short period, treated 123.6 tons of copper ore and by-products for a yield of 6 tons 8 cwt. 3 gr. of copper and 76 oz. 4 dwt. of fine gold. The Mount Morgan tailings, on the areas adjoining the Mount Morgan company's property, are to be again worked. Arrangements have been made by W. Usher, of the Old Union mine, Crocodile, with Arnold, Lowry & O'Connell, who have for some time been working sand claims on the Dee river, to erect machinery for the purpose of retreating the tailings on their holdings. Careful assays of the tailings have been made, which point to the conclusion that not only are the tailings worth working as heretofore for their copper contents, but that they will also pay to treat for gold. Early in the new year, therefore, Mr. Usher proposes to erect a 10-head stamper battery, with Berdians and Wilfey tables, to recrush and treat all the tailings which have accumulated in the claim. The gold contents may not be very considerable, but by the introduction of labor-saving appliances the new proprietors are convinced that there is money in the venture. A sand pump will be erected to pump the tailings into the battery hoppers, and by this means the cost of handling the material will be so reduced that a very small percentage of gold will pay the working expenses. Formerly the battery screens were much coarser than those used at present, and it is anticipated that, by recrushing the tailings, a further percentage of gold will be secured by this means. Mr. Usher also proposes to treat the tailings and water for their copper contents on a much larger scale than formerly, and for this purpose intends to erect a powerful centrifugal for pumping the water into the precipitating vats and chutes. Heretofore ores carrying from 1½ to 3½ oz. gold per ton have yielded all but 20 gr. to 26 gr. by chlorination. Low-grade ores, going 12 dwt. per ton, gave an extraction of from 93% to 94%. Crushing and roasting has cost about \$2 per ton, chlorinating \$1.50 and mining \$2 per ton. The average of the ore treated is between 11 dwt. and 12 dwt. of gold per ton. The Mount Morgan Co.'s new dam, on the Upper Dee river,

has a capacity of 220,000,000 gallons. The reservoir is in some parts 300 yards wide, and is 30 feet deep at the weir, costing \$20,000. The weir was completed four years before there was sufficient rainfall to fill the reservoir, but it has now been practically full for some time.

### BRITISH COLUMBIA.

#### Atlin District.

At Atlin A. C. Hirschfeld is manager of a company interested in developing recent magnesite finds. Regarding mining on Pine creek, A. Carmichael in the Atlin Claim says that the Pine Creek Power Co., F. T. Blunck president, and M. W. Loveridge hydraulic superintendent, have been working the south benches of Pine creek, moving 130,000 cubic yards of gravel in 1904. J. M. Ruffner, manager of the North Columbia Hydraulic Co., purchased the Eastern leases from the Eastern Hydraulic M. Co., together with ditches and plant. The Caledonia group, worked under the management of F. H. Brackett and owned by the Atlin and Willow Creek M. Co., produced \$15,000 during the past season. On Gold Run the British-American Dredging Co., O. T. Switzer, general manager, operated their Bucyrus continuous bucket type dredge during the summer. On Spruce creek the Spruce Creek Power Co., with E. T. Blaine as manager, and H. Haslett, hydraulic superintendent, acquired interests of the Con. Spruce Creek Placers, Ltd., and put in a plant. The British Columbia Dredging Co., A. C. Denniston, general manager, at Blue Canyon, built a 7½-foot open connected type, elevator dredge. A right-of-way 7½ miles long was cut out, and a pole line erected, to connect with power line from Pine Falls to Gold Run. On Boulder creek the Societe Miniere de la Colombie Britannique, H. Maluin, manager, is worked by drifting and hydraulic mining. In 1903, under the management of J. H. Black, in nine months 45,000 cubic yards of gravel were moved, of which 15,000 cubic yards were elevated and sluiced, from which \$60,000 was won. In eleven months in 1904 they earned \$74,000, the largest amount won from any single operation in the district. The steam hoist consumed 700 cords of firewood and the mine used up 2600 sets of timber and 25,000 lagging. On the company's property, hydraulic mining was also engaged in, under the superintendence of J. Fall, which brought the total yield close on \$90,000. On McKee creek the Amalgamated McKee Creek Co., C. M. Hamshaw, manager, has acquired the interests of the Atlin M. Co. and the McKee Creek Con. Co. They uncovered 8000 square yards of bedrock, the gravel yielding \$42,000 in gold. Including the yield of ground let on lays, the company report an output of \$52,500. To more economically work this property, the management propose to put in a steam or electric shovel plant, construct an electric tram line to Atlin Lake, 2½ miles distant, and there, with the unlimited dump and supply of water available, wash the pay gravel. At Birch creek, the Atlin Lake M. Co., under the management of B. Williams, washed 30,000 cubic yards of gravel and won \$12,000 in last summer's work. Besides this company, there were twenty placer miners working. On upper Otter creek, the Otter Creek Hydraulic Co. completed the installation of a complete plant and are opening up the mine. It is reported that Carmichael & Moran will work it next season. On Wright creek, Davis, Gierke, Hodges and Kershaw have opened up the ground owned by the English Counties Hydraulic Syndicate, C. D. Mason, manager. They put in a small hydraulic plant, which includes an automatic cableway for handling stones. The Ruby Creek Mining Partnership, on Ruby creek, under superintendence of R. McKay, made an open cut, 200 feet long, and sunk a shaft to bedrock struck 47 feet from the surface. From the bottom of the shaft a cross-cut was driven 40 feet, showing pay gravel 25 to 30 feet in depth and the crosscut as far as driven failed to reach its limits. On Bull creek, the Bull Creek Syndicate built 2500 feet of ditch and 400 feet of bedrock flume; it has 4500 feet of loose lumber on the ground, and washed 10,000 cubic yards of material and cleaned 585 square yards of bedrock. A. Carmichael is manager. Consolation creek, whose source is in the same range as that of Boulder and Ruby, but which flows into Gladys lake, in the Teslin watershed, was prospected last summer by O. C. Solt and J. M. Buchanan, who staked discovery on September 14. A stampede followed. Miners working there now speak with confidence of the future of that district.

The United States Consul at Victoria reports that it has been found impossible to successfully work hydraulic mines in many portions of British Columbia at the prices paid for white labor, and an effort is to be made again next season to introduce Chinese labor in the hydraulic mines at Atlin. A few years ago a number of Japanese were taken into the district for this purpose, but the determined opposition of the local miners' union compelled the mine owners to abandon their intention. Since the conditions have considerably changed, there being far fewer white miners in the district than formerly, while it has been clearly shown that it is not possible to profitably operate many of the Atlin hydraulic properties without largely reducing the cost of labor. Under these circumstances it is probable that there will be less opposition to the contemplated employment of Chinese labor, particularly as it is proposed to increase the wages of white miners now in the district, who will be employed as foremen or overseers. In other cases the labor problem is being solved by dredging.

#### Boundary District.

Manager J. P. Graves, of the Granby property at Phoenix, expects to get the two furnaces ready for blowing in by July 1. Work is being rushed, and the mine management will be ready to install the additional equipment when it arrives. Then the monthly capacity of the smelter will be from 70,000 to 75,000 tons.

Assets of the Winnipeg Mines, Ltd., in Wellington camp, have been sold for \$2500 to satisfy the labor liens against the property, which have remained unpaid for more than a year, to W. T. Hunter, representing himself, C. D. Hunter, J. Hunter, W. S. Macy and A. B. Hodges. Five thousand feet of development work has been done, including a 350 incline shaft and much drifting. The buildings are comparatively new, and the air

compressor, boiler, pumps, etc., are in shape to do business.

The E. P. U. mine, at Providence, is working twenty-one men.—The Goldfinch mine, belonging to M. F. Madden, has started operations.—J. F. McAllister, superintendent of the British Columbia Copper Co.'s smelter at Greenwood, has been in New York to confer with the board of directors respecting the proposed enlargement of the plant.—A. D. McPhee, superintendent of the McKinley mine, Franklin camp, north fork of Kettle river, says that the glory holing system of mining will be used at the McKinley when operations are resumed in April. The ore zone is 352 feet wide, and has been opened up by surface cuts and stripping.

#### Kootenay District.

B. Crilly, former superintendent of the Great Northern mines, and interested in Poplar Creek mines, states that the Great Northern mines will put in an additional ten stamps, making twenty stamps in all. Forty stamps will be put in on the Lucky Jack and Swede at Poplar creek.

A ½-mile tram will be built from the Swede group to Poplar.—On the Broken Hill, on Rapid creek, a stamp mill will be put in.

#### Nelson District.

Nickel in commercial quantities has been found on the Yankee Girl mine, near Ymir. An assay for nickel showed 5.1%. This is the first discovery of nickel in commercial quantities in British Columbia. At present there are no smelting facilities nearer than Sudbury, Ontario. The owners of the Yankee Girl are communicating with the smelters there, and it is probable that a trial shipment will be made. The Sudbury ores, which are the chief items in the world's supply of nickel, average 3% nickel.

#### Southeast Kootenay District.

It is expected that smelting at the new plant of the Sullivan Group M. Co. at Marysville will start with the first furnace about March 1. The second furnace, a duplicate of the first, with a capacity of 200 tons of lead ore daily, is expected to be running March 15. At the mine, near Kimberly, B. C., thirty-five men are at work on development and stopping. When the smelter starts its first furnace the crew should be increased to fifty miners. The tramway, 6300 feet long, connecting the mine with the Canadian Pacific railway, is running, and ore is being moved. The bins are complete, and ore is being crushed, while shipments of a car of siliceous ore are being received daily from the Quilp mine at Republic, Wash. The Quilp has a contract with the Sullivan for supplying all the siliceous ores required. Lime ore for flux is being received from the Hunter V mine, near Ymir. It is a low-grade silver product. The new Haberlin converter, being also tried experimentally by the American S. & R. Co. at Pueblo, Colo., is designed to reduce the sulphur and facilitate the free extraction of the zinc. The crude ore runs about 15% to 22% sulphur. It is crushed coarse and roasted in a revolving machine, to cut down the sulphur charge to 8%. Then it is still further converted in the Haberlin plant by a hot blast, which heats the ore almost to fusion and cuts down the sulphur charge to 4%. The ore, instead of being reduced to fine granules, as is done in most roasters, is left in good sized pieces much like coke, and the removal of the sulphur leaves air passages all through its texture. It is fed into the furnace without the expense of briquetting. In the smelter furnace fusion is secured with twice the speed of the old-time methods, since the blast is swept through the porous ore. There are only two products from the smelter—the silver-lead bullion and the iron-zinc-sulphide slag. The third product—a sort of middlings, made from slag mixed with lead—which is produced in smelting practice under ordinary conditions is avoided.

### BRITISH GUIANA.

During 1904 British Guiana exported 90,102 ozs. 13 dwts. 10 grs. gold, valued at \$1,599,042.95, and 11,045½ carats in diamonds, valued at \$85,947.22.

### CANADA.

#### Alberta.

The International Coal & Coke Co. elected: President, A. C. Flumerfelt; vice-president and treasurer, H. M. Galer; secretary, W. G. Graves. The company shows that Superintendent Reynolds took charge January 1, 1904, and during the year machinery was received, buildings erected, railway switches constructed, water works installed, and the whole plant was placed in a position for operation. A battery of 104 standard beehive coke ovens have been put in. The boiler and power house are built of masonry, with stone walls separating. This building is 82x78 feet and contains four 100 H. P. boilers, and foundations and connections are in for two boilers, heaters and pumps. In the power room two 250 kilowatt Westinghouse electric generators are directly connected with two 400 H. P. engines. A compressor for an air haulage system, compressing to a pressure of 1000 pounds, has been put in. The electric current generated runs a 150 H. P. motor, which drives an 11-foot Capell fan, with a capacity of 150,000 cubic feet of air per minute. An air locomotive does the hauling from inside the mine to the tippie. The tippie bins have a capacity for 2500 tons of coal and slack, and is so arranged that the coal and slack drop into different bins. As the mine cars of coal approach the tippie they run over a weigh scale, and from there onto a self-dumping cage, which is raised to the top of the tippie by a 100 H. P. hoist. When these cages arrive at the top they dump the coal onto screens, the slack goes through into slack bins and the coal onto two picking tables, 5 feet wide and 40 feet long, run by a 25 H. P. motor, and as the coal passes over these picking tables all rock and refuse matter is picked off. The coal runs out of the tippie bins by gravity, through a chute into cars. The slack for the ovens is taken from the slack bins and conveyed by electric carriages to the coke ovens, where it is charged. At the slope a 50 H. P. boiler and a 5x7 hoist has been used for development work, but will be replaced by a larger hoist. In 1904, 51,000 tons of coal and coke were shipped.



## Vancouver Island.

(Special Correspondence).—The January returns of the Tyee Copper Co. show that the smelter at Ladysmith ran twenty-three days and smelted 5065 tons of Tyee ore, giving a return after deduction of freight and refining charges of \$68,662. The reduction plant is 20 miles from the mine at Duncans. The ore is received from the railroad at the receiving bins, having a capacity of 1600 tons, from which the ore is run into cars running on tram track on movable bridges with wheels. The ore is then heap roasted in piles 50 feet long by 24 feet wide and 7 feet high, each containing 225 tons of ore, using six cords of wood to the pile. It takes four weeks to burn the pile to 5% sulphur.

Duncans, Feb. 19.

## Yukon Territory.

The Yukon Territory, which prior to 1898 formed a part of the Northwest Territory, has an area of 196,976 square miles, 196,327 being land and 649 water. The population is estimated at 12,000, of whom 7200 are Americans. It is purely a mineral country, and has produced since 1885, when the output of gold was first recorded, to the end of 1903, \$97,063,500 in gold. During the same years the gold mined in the rest of Canada was as follows: Saskatchewan district, \$292,946; Province of Ontario, \$2,086,393; Province of Quebec, \$103,940; Province of British Columbia, \$40,545,398; Nova Scotia, \$9,318,984; a total of \$52,347,661. The production of Yukon Territory thus exceeded that of the rest of Canada, since 1885, by \$44,715,839. In the most prosperous years for the Yukon, those from 1898 to the present, the production of gold has been as follows: 1898, \$10,000,000; 1899, \$16,000,000; 1900, \$22,275,000; 1901, \$18,000,000; 1902, \$14,500,000; 1903, \$12,250,000; a total in six years of \$93,025,000. Dawson, the capital of the Yukon Territory and the residential and commercial center of what is commonly known as the Klondike, has a population of 3500 persons of various nationalities, the Americans, with 2450, forming 70% of the total. The city is easily reached during the season of navigation (from about May 15 to October 10) in seven to nine days from Seattle, Wash., or Vancouver, British Columbia, by three lines of steamers to Skagway, Alaska (three to four days), where connection is made by rail to White Horse (one day), the head of navigation on the Yukon river. From White Horse the White Pass Line runs comfortable boats to Dawson in from three to four days. This company operates, between White Horse and Dawson, twelve vessels and five barges, with a capacity of 3500 tons. During the season of 1904 it handled 22,447 tons of freight and carried 4932 passengers. Passenger rates from Seattle to Dawson are \$80 first class and \$65 second class. Freight rates from Seattle to Dawson by the carload are \$3 to \$4.25 per 100 pounds. Commodity rates from the Pacific coast points during midsummer are \$2.37 per 100 pounds. From Dawson the rates to Eagle, Chena or Fairbanks, and Fort Gihon, Alaska, are, per ton, \$10, \$70 and \$40, respectively. The White Pass rail division between Skagway and White Horse, 111 miles, operates daily passenger and freight service, with a capacity of at least 5000 tons a day. There is a second though much longer route, taking twenty-three days from Seattle to Dawson by way of St. Michael, Alaska. Two steamboat lines run on the lower Yukon river between St. Michael and Dawson—the Northern Commercial Co. and the North American Transportation & Trading Co. The former operates twenty-two steamers and barges, with a total net tonnage of 7851 tons, and the latter nine steamers and barges, with a total gross tonnage of 6083 tons. The passenger rates by these two lines is \$125 from Seattle to Dawson, and the average rate per ton on freight is \$60. Besides the boats of the above companies there are eleven independent steamers, American and Canadian, plying between White Horse and Dawson and points in Alaska on the Yukon river. Some of these have comfortable accommodations for passengers.

At Dawson the Canadian Klondike M. Co. of Detroit will install a 400-kilowatt turbo-generator to be driven by a 600 H. P. Westinghouse-Parsons steam turbine to operate dredge boats being built by the Marion Steam Shovel Co. of Marion, Ohio. On these boats will be installed induction motors varying in size from 7½ to 100 H. P. The power house will be at Dawson City, and the dredges will operate on the Yukon river and its tributaries. Lines for transmitting power will be strung from the station to the boats, wherever they may be working.

## CENTRAL AFRICA.

J. R. Robinson, mining engineer of the British Central Africa, Ltd., has selected four 506 square mile blocks of country, 2000 reef claims and two extensive coal areas in the B. C. A. Protectorate; also a large number of gold reef claims in the territory of the Companhia D. A. Zambesia, near the northern Portuguese boundary. Within these areas important finds have been made of lodes containing gold, argentiferous galena, pyromorphite, cerussite and copper ores, also graphite, iron ore, limestone and transparent mica, in plates from 12 to 16 inches, in the North Nyassa district, adjacent to the Anglo-German frontier. From the discoveries recently made, it would appear that the vast territories north of the Zambesi offer immense mining possibilities on the introduction of the necessary capital. The recruiting of labor in this district for the Transvaal mines has proved successful. All the natives recruited have volunteered their services without the faintest hesitation. The Government officials do not render the slightest assistance in the recruiting of natives under their jurisdiction. The natives who have returned from the mines speak well of the way that they are treated and paid by their employers in the Transvaal. There are thousands of natives living near Lake Nyassa who are unable to procure employment from the sparse European population in the northern provinces; consequently, 15,000 go to South Africa annually from Angoniland, Atongaland and the Apeya country. The vast and densely populated region lying between lakes Mweru, Bangweulu, Tanganyika and Nyassaland has never been exploited for labor, and an inexhaustible supply could be drawn from that quarter, providing permission was granted by the Rhodesian authorities.

## KOREA.

The U. S. Consul at Seoul reports that the largest American enterprise in Korea at the present time is the Oriental Consolidated M. Co., operating on a concession 500 miles square in northwest Korea. It employs seventy white men and several thousand Asiatics, and operates five mills on its concession, with a total of 200 stamps. In 1903 it mined and milled 203,567 tons of ore, valued at \$1,478,956, and had in sight on December 31 ore to the value of over \$6,000,000. It has now about completed a large dam for a reservoir to furnish water power for an electric plant, by which its mills will be run. The plant is to cost completed \$200,000. In this connection the following figures, giving the export of gold from Korea to foreign countries for the past ten years, is of interest: 1894, \$465,169; 1895, \$473,758; 1896, \$692,425; 1897, \$1,012,971; 1898, \$1,183,111; 1899, \$1,460,824; 1900, \$1,809,258; 1901, \$2,486,688; 1902, \$2,521,925, and 1903, \$2,717,285. These figures do not include a considerable quantity of gold mined by natives but not exported through the treaty ports. Other foreign mining concessions are operated in Korea by British, German and Japanese companies, but have thus far proved by no means so successful as that of the American company. Considerable deposits of gold have recently been discovered a short distance from the city of Pyongyang, in the northwest, and it is reported that 25,000 Koreans are now in that region engaged in placer mining. It is doubtful, however, if the deposits in that locality will hold out very long, and the returns to each individual miner can not be very great. In 1903 mining supplies to the value of \$212,964 were imported.

## MEXICO.

The Dynamite Concession amendment states that on March 1, 1905, or when the National Dynamite & Explosive Co. is in better condition to supply the Mexican markets with dynamite, a duty of \$210 per metric ton (1000 kilos) will be put on foreign dynamite—this is 21 cents a kilo. While the concession is in force the duty shall not be reduced below \$30 per ton, the present rate on imported powder. This is the duty, or rather tax, that the native dynamite factory has to pay the Government on all dynamite manufactured. Common black powder, fuse and caps, which are not made in this country, are exempt of these duties. If the duty of \$210 should not be put on at the time stated above, or Congress sees fit to reduce same after it has gone into effect, the Government shall make good the loss sustained by the National Dynamite & Explosives Co. The company may make any grade of dynamite that is required, but must keep in stock for consumers dynamite containing 30%, 40%, 50%, 60% and 75% nitroglycerine or other explosive of the same character that has been appropriated by the Government. The prices of native dynamite are fixed by the Government, and a discount of 5% is allowed with the understanding that all cases contain 22.68 kilos, or about 50 pounds. The prices fixed by the Government vary according to location (supposed to be based on the freight rates from the works to the different points) and can not be increased except in special cases and by the Secretary of the Fomento. Until there is a means of transportation to the Pacific coast, dynamite can be imported into that section with a duty that would make the dynamite cost the same as if it were shipped from the native factory. The following are the prices in cents sold per pound for some of the principal mining camps:

	30%.	40%.	50%.	60%.	75%.
Parral.....	15.58	16.85	18.13	19.40	21.95
Aguascalientes.....	15.35	16.62	17.89	19.17	21.72
Chihuahua.....	14.71	15.98	17.25	18.53	21.08
Guadalajara.....	15.35	16.62	17.89	19.17	21.72
Mapimi.....	15.29	16.56	17.84	19.11	21.68
Oaxaca.....	16.91	18.18	19.46	20.73	23.28
Pachuca.....	15.35	16.62	17.89	19.17	21.72

On the Pacific coast, until such time as means of transportation are provided, permission is given to import dynamite through the custom houses paying the amount which would correspond to the same if manufactured by the company.

## Chihuahua.

H. C. Wilmet of New York will develop the San Martin claim in Santa Barbara belonging to D. P. Ellissague. —W. M. Brodie, Box 219, Chihuahua, is to secure data regarding the building of a smelter at Chihuahua.

## Guajuato.

It is reported that D. V. A. Williams of the City of Mexico has interested people from Detroit, Mich., in building a 100-ton custom mill and cyanide plant at Marfil to treat the low grade ores of the district.

## Jalisco.

G. E. Purnell, president of the Guadalajara Banking Co., at Guadalajara, is preparing to reopen and work the Boca Ancha mine in the Parnase district. The mine is being equipped with hoiler, pump and hoist, and plans and estimates are being prepared for the erection of a plant.

## Sonora.

(Special Correspondence).—A party of mining experts from New York, including R. T. Hill, formerly with the U. S. Geological Survey, have been inspecting the Greene properties at Cananea. The Arizpe M. Co. report having struck a vein of silver in their Alacran mine which assays 560 ounces. This mine is 35 miles south of Cananea. —The Swansea M. Co., at Cananea, are pushing development work and are constructing an additional tunnel 500 feet long. —F. L. Proctor and McMillan Bros. of Cananea, owners of the Dos Naciones claims adjoining the Cobre Grande, have found rich silver and copper ore running \$40 per ton. —El Tigre mine has put in six new Nissen stamps. They are the first of the kind to be used in this section and are giving satisfaction. —High-grade ore is reported to have been struck in the Copper Belt mine, recently purchased by the Phelps-Dodge Co. —Surveying parties are locating a route for the proposed line by which W. C. Greene will transmit electrical power from a plant to be built on the Yaqui river, 80 miles from Cananea. The plant will be run by water power, and will be used to operate the smelter at Cananea and various saw mills in the Sierra Madre district. —The Calumet & Sonora have defini-

tely fixed their boundary lines, which were in dispute, and development work will now be pushed rapidly. Cananea, Feb. 19.

The Keystone Exploration Co. has been formed to work sixteen claims near Nacozari. R. C. Miller of Boston, Mass., is president; S. M. Langworthy of Cedar Rapids, Iowa, vice-president; H. B. Miller of Boston, Mass., secretary and treasurer; R. O. Dillon of Nacozari, Mexico, superintendent. —G. Woodward has sold the San Juan de Bautista mine, near Moctezuma, to the Beneficence M. & M. Co. for nearly \$2,000,000. The company is a part of the Washington-London Guarantee Investment Co. It is claimed work will be commenced on the property as soon as possible, and there is talk of a reduction plant. The ores are gold and the mine is an antiqua.

## Personal.

H. HARKER is superintendent Gold Dust mine at Leesburg, Idaho.

ALGERNON DEL MAR is at Silver Peak, Esmeralda county, Nev.

E. O. DANE is assistant engineer Mountain Copper Co., Martinez, Cal.

J. CLECHORN is superintendent Utah-Goldfield M. Co. at Goldfield, Nev.

CHAS. RUTER is examining mines near Kingman, Mohave county, Ariz.

F. BEEDLE is visiting in Deadwood, S. D., on a vacation from West Africa.

F. C. FENNER is managing director Wolverine & Arizona M. Co. at Bisbee, Ariz.

S. BLIGHT has returned to Grass Valley, Cal., from La Cananea, Sonora, Mexico.

A. C. GALLUPE is superintendent Mineral Hill mine, near Placerville, Boise county, Idaho.

E. W. JONES is superintendent Cerro Azul M. Co.'s properties near Imuris, Sonora, Mexico.

N. C. BONNEVIE of Denver, Colo., has returned there from Pittsburg, Pa., and other Eastern cities.

W. H. LEFFINGWELL, a mining engineer of Salvador, Central America, is in Berkeley, Cal., on a visit.

W. R. RUST, general manager Tacoma smelter has returned to Tacoma, Wash., from Los Angeles, Cal.

B. MATTIOTTI has charge of the Japan mine in Savage basin, near Telluride, San Miguel county, Colo.

S. CHOATE is superintendent of the Gold Bullion M. & M. Co. working on Monumental creek, near Roosevelt, Idaho.

F. A. HARTMAN, president of La Dura M. Co., has returned to Los Angeles, Cal., from La Dura, Sonora, Mexico.

E. A. H. HAYS has resigned as manager of the mines and smelter at Maconi, Mexico, and is at Fuerte, Sinaloa, Mexico.

M. McDONALD is general manager Goldreed M. Co., and R. Wardle, superintendent Goldreed, Esmeralda county, Nev.

M. D. PICKEL is superintendent of mines on Newman hill, near Rico, Dolores county, Colo., worked by the San Juan Ore Co.

F. ADAMS, manager Economic mill at Victor, Colo., has resigned and will go to Big Horn, Idaho. He will be succeeded by F. Kreutzer.

W. H. GODFREY, superintendent St. Paul & Montana M. Co., has been in the East on business connected with mines on Wisconsin creek, near Sheridan, Mont.

AL. ROBERTS has resigned as assistant superintendent of the Combination M. Co. at Goldfield, Nev., to become superintendent St. Ives M. Co. at Goldfield, Nev.

A. E. DRUCKER is superintendent of a gold and copper property in the Moctezuma district, Sonora, Mexico. D. G. Putnam of Los Angeles, Cal., is at the same property.

R. H. LEADLEY, for the past three years with the Torreon smelter in Coahuila, Mexico, is now with the Yaqui S. & R. Co. at San Antonio de la Huerta, Sonora, Mexico.

H. T. TRIPP has been appointed superintendent of the Alaska Nowell G. M. Co., with J. McBride as assistant superintendent at Nowell City, 75 miles northwest of Juneau, Alaska.

## Obituary.

J. M. TONG, a mining man of Clear Creek and Summit counties, Colo., died in Georgetown, Colo., February 9, after an illness of a week.

P. W. KEYES, a pioneer mining man of the Comstock, was found dead at the bottom of the dump of the Mammoth mine, in Six Mile canyon, near Virginia City, on Feb. 16. Keyes had been at work in the mine and was riding an ore car to the dump, when he lost control of it and rolled over the precipice to his death. Keyes died a comparatively poor man, though at one time the late J. W. Mackay offered \$75,000 for his interests in one mine near Virginia City.

WM. SKINNER, a well-known mining man, was killed on Feb. 3 by falling from the gallow's frame of the San Patricio mine, near Parral, Mexico, to the bottom of the 150-foot shaft. His body struck a car at the top of the



shaft. He was born in Scotland in 1853 and has been in Mexico twelve years. He had charge of the mines of the Montezuma Lead Co. of Santa Barbara three years ago, and since has been in Parral.

## Books Received.

Electrical engineers testing direct-current machines and students of electricity at technical schools will welcome "The Testing of Continuous Current Machines," by Chas. Kinzbrunner, as a lucid guide for their work. The subject of instruments and apparatus is clearly presented, both in text and in illustrations; minute directions are given for the measurement of resistance, temperature, insulation, speed, magnetism, efficiency and losses; the subject of characteristics is well presented, and the appendix gives a number of typical test sheets that many practicing electricians could well follow. The practical testing and care of machines is given more space than is ordinarily found in such text books. Besides the detail and exactness of direction, the main recommendation to the book is that it not only tells what to do, but also why you do it. It is published by John Wiley & Sons, 43 East 19th St., New York City, for \$2, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of the price.

"Zinc and Lead Deposits of Northwestern Illinois," by H. F. Bain, Bulletin No. 246 of the United States Geological Survey. It gives a good description of the present condition of zinc and lead mining in this region and forms a valuable contribution to the literature on economic geology. It states that, while zinc and lead minerals are found in southern Illinois with fluorspar, yet the commercial deposits are confined to the northwestern district, Jo Daviess county, near Galena, forming a portion only of the upper Mississippi zinc and lead field, which lies mainly in Wisconsin, but includes parts of Illinois and Iowa. The region is one of unmetamorphosed, little-disturbed, sedimentary rocks of Paleozoic age, and there are no igneous rocks in or near it. In this it stands in sharp contrast with most other districts in which sulphide ores are important. Within the Illinois district only Ordovician and Silurian beds occur. The ore is found as galena and spalerite in "crevices" or gash veins in the dolomite, shales and sandstones.

The progress that has been made in the application of electricity to metallurgy is shown by comparing the second English edition of "Electric Smelting and Refining," translated by W. G. McMillan from W. Borchers' German work with the first edition, published in 1897. According to the latest edition, over thirty elements are now commercially extracted by means of the electric current, either in the electric furnace or electrolytically. The book is really a short treatise on metallurgy, for it gives a brief account of all the important methods of extracting the metals that are also obtained by the electric current. Like most technical books, the subject matter presented has been somewhat antiquated by the current technical press, and while it gives a fair survey of the field up to the opening of the present century, yet it omits a number of interesting accounts of the more recent applications of electricity. It should be read by all interested in this branch, as it will probably save much unavailing research along lines already tried but found unsuccessful; but it should be followed by a study of the recent technical publications. Considerable space is devoted to unsuccessful methods, possibly in the hope of showing others where mistakes have been made. Probably trade secretiveness has prevented the publication of many recent developments—for instance, the production of nitrogen compounds from the atmosphere—to which no reference is made. The chapter on the electro-metallurgy of copper is good. It is published by Chas. Griffin & Co., Exeter St., Strand, London, England, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of \$5.

## Commercial Paragraphs.

J. N. FLOOD, Denver, Colo., is visiting the works of the Gardner Electric Drill & Machinery Co., Cleveland, Ohio.

E. C. MEANS is with the Westinghouse Electric & Mfg. Co. in their Denver, Colo., office at 429 Seventeenth street.

T. H. PROSKE, 1734 Fifteenth street, Denver, Colo., reports the sale of a Little Giant drill sharpener to the Clover Leaf G. M. Co., Roubalx, S. D., and one to the Silver Lake mines, Silverton, Colo.

THE S. H. SUPPLY CO., Denver, Colo., are shipping machinery for a 20-stamp mill complete, with power, to Oregon; a carload of pumping machinery to Parral, Mexico, and a complete 50-ton concentrating plant to the Homelit M. Co. at Silverton, Colorado.

CARY & FIELDING, 1711 Tremont street, Denver, Colo., agents for Rand Drill Co. and the Power & Mining Machinery Co., have received orders for 4 Rand compressors for use in Colorado; one to go to South Dakota and 30 Rand drills for shipment to different parts of the country, also one cyanide plant for South Dakota, 3 Pierce amalgamators and one carload of ore cars for Cripple Creek, Colo.

F. W. THOMPSON, manufacturer of assayers' balances, 1717 Arapahoe street, Denver, Colo., reports the following recent sales of his patent multiple rider carrier for use on assayers' balances: Pueblo Plant, American S. & R. Co., Pueblo, Colo., 2; Eagle Ore Sampling Co., El Paso Con. G. M. Co., Mary McKinney M. Co., J. I. Brown, Cripple Creek, Colo., 1 each; E. E. Burlingame & Co., Denver, Colo., 1; Colorado School of Mines,

Golden, Colo., 1; Minnesota School of Mines, Minneapolis, Minn., 4.

THE Los Angeles-Pacific Railroad Co. will increase the capacity of their central power house at Vineyard, Cal., and install an additional substation in Los Angeles, Cal. The new electrical equipment has been contracted for with the Crocker-Wheeler Co. through its Pacific coast managers, the Abner Doble Co. of San Francisco, Cal. The contract comprises one 1200 K.W., three-phase, 50-cycle, 2300-volt, engine-type generator with a speed of 125 revolutions per minute; one 300 K.W. motor-generator set; one 400 K.W. motor-generator set; three 400 K.W. transformers; three 160 K.W. transformers; three 120 K.W. transformers and a 60 K.W. engine-type exciter.

## Latest Market Reports.

SAN FRANCISCO, February 24, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 28½d (standard ounce, 925 fine); New York, bar silver, 61c, refined (1000 fine); San Francisco, 61c; Mexican dollars, 51c, San Francisco; 47½c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.50@15.50; Electrolytic, 1 to 3 casks, \$15.50; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18½@24c. London: £68 6s 3d spot per ton.

The total visible supply of copper on hand February 1 was 15,733 tons, made up as follows: Chilean in Liverpool and Swansea, 4539 tons; American in Liverpool and Swansea, 2498 tons; sundry amounts in Liverpool and Swansea, London and Newcastle, Birmingham and France, 2621 tons; English in Liverpool and Swansea, 2200 tons; afloat from Chile and Australia, 3875 tons. There is no material change in the copper situation. The stock on hand shows a slight falling off from Jan. 1, 1905, and is lower than that of Dec. 1, 1904.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 10s 0d per long ton.

SPELTER.—New York, \$6.20; St. Louis, \$6.30; London, £24 7s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$28.75@29.00; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, \$3.2½@35c. London, £130 15s spot.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.75c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, \$1.50; dust, \$1.10; 10c; sulphate, \$1.04c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.85@17.10; gray forge, \$16.85; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 cts., \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 per bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 8½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chloride of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linsed, boiled, bbl., 55c; cs., 60c; raw, bbl., 53c; cs., 58c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 19c; As, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c; Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 67c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, per lb., 80c.

PHOSPHORUS.—American, per lb., 70c.

SILVER.—Chloride, ½ oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Per lb., \$2.75.

MAGNESIUM.—Pure, N. Y., \$1.60.

SODIUM.—Metal, per lb., 50c.

BISMUTH.—Subnitrate, per lb., \$2.10.

URANIUM.—Oxide, per lb., \$3.50.

MERCURY.—Bichloride, per lb., 77c.

TUNGSTEN.—Best, per lb., \$1.25.

FIRE BRICK.—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skew back, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double and dry ground, f. o. b., factory, \$8.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

ELECTRICAL WATER HEATER.—No. 782,525. Feb. 14, 1905. M. H. Shoenberg, San Francisco, Cal. Assigned to Shoenberg Electric Appliance Co. of San Francisco, Cal., a corporation. This invention relates to an apparatus which is designed for continuously heating a flowing stream of water. It consists in the combination with an insulating heating chamber having supply and discharge passages at opposite ends of an electrical conductor located within said chamber and immersed in the liquid to be heated, and in the combination and arrangement of mechanism arranged and adapted to produce the desired result.

ELASTIC POWER TRANSMISSION DEVICE.—No. 782,560. Feb. 14, 1905. G. H. Harris, Stockton, Cal. This invention relates to a device for transmitting power and relieving the jar and shock due to intermittent or irregular impulses between the two parts. In the transmitting of power from apparatus which is subject to irregular impulses, such as gas engines, or where the power may be regular, but there are irregular strains upon the part to which the power is transmitted, it is desirable to relieve the parts of the sudden shock of these changes without injuriously affecting the actual transmission. This device is designed in its various parts and construction to bring about the desired result.

FLOATABLE CONCRETE PIER.—No. 782,557. Feb. 14, 1905. S. Hadlock of Port Hadlock and F. E. Brown of Port Townsend, Wash. This invention consists in the formation of a hollow structure of concrete which is adapted to be floated to position and in the combination of any number of such structures, which may be permanently fixed to form a wharf, pier, caisson, or other desired permanent structure. The object of the invention is to provide a hollow structure of concrete with suitable chambers, which structure may be built on ways, and after being built can be launched and floated to any point where it is to be used. If used for a wharf or equivalent structure, it may be sunk upon or into the material forming the bottom of the water, and any number of these independent structures may be aligned to form any desired wharf or structure, said caissons or boxes being afterward filled so as to become permanent.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING FEBRUARY 14, 1905.

782,320.—UNDERREAMER—J. J. Brewster, San Francisco.  
782,438.—FURNACE—L. D. Rome, San Francisco.  
782,807.—DUMP CAR—C. Erickson, San Luis Obispo, Cal.  
782,334.—STOVE—C. M. Gunn, Sausalito, Cal.  
782,446.—FORM FOR CEMENT WORK—C. Gustafson, Oakland, Cal.  
782,557.—CONCRETE PIER—Hadlock & Brown, Port Hadlock, Wash.  
782,560.—POWER TRANSMISSION—G. H. Harris, Stockton, Cal.  
782,562.—TELEPHONE REGISTER—M. Hitt, Los Angeles, Cal.  
782,413.—TRASH CLEANING MACHINE—J. A. Hughes, Blaine, Wash.  
782,608.—BOILER CLEANER—F. W. Jackson, Needles, Cal.  
782,508.—CASING SPEAR—F. W. Jones, Santa Pau, Cal.  
782,666.—CLOTHES PIN—F. Kirkpatrick, Riddles, Or.  
782,611.—AMALGAMATOR—M. V. Lasswell, Oakland, Cal.  
782,451.—CUTTING SHEET METAL PLATES—J. Lee, San Francisco.  
782,674.—GEAR WHEELS—T. W. Lowe, Stockton, Cal.  
782,786.—TROLLEY POLE—J. F. Magney, Los Angeles, Cal.  
782,413.—TRASH CLEANING MACHINE—J. A. Hughes, Blaine, Wash.  
782,470.—BRIQUET MACHINE—R. Schor, San Francisco.  
782,525.—WATER HEATER—M. H. Shoenberg, San Francisco.  
782,433.—BUCKLE—G. Shoenberger, Long Beach, Cal.  
782,471.—ENGINE—Sterne & Davis, San Diego, Cal.  
782,425.—GOLD SEPARATOR—Stevenson & Heft, Grants Pass, Or.  
782,472.—FURNACE—Tucker & Grundell, San Francisco.  
782,513.—REAR ENGINE—E. Uren, Sacramento, Cal.  
782,477.—BOTTLE—O. Yates, Portland, Or.



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## Old Times and the New.

There are some peculiarly noticeable features in the mining industry at this time which are worth more than passing notice. One of the most important of these noteworthy conditions is the successful operation of mines which were abandoned years ago, and which had long remained idle. Another feature is the finding of large and valuable ore bodies in unsuspected places in active districts, such as Cripple Creek and Leadville, Colo. The latter is merely the result of energetic prospecting and may be taken rather as an indication that the earlier operators were not so thorough in their development work as the miners of the present. In the Cripple Creek district most of the new finds have been made within a few feet of the surface, though strikes at depths between 800 and 1200 feet are not of uncommon occurrence there. It is more particularly the reopening of long abandoned and presumably worthless mines that is worth consideration, and it is from a study of the causes that make success possible to-day, which was not apparently obtainable in earlier years, that a lesson of profit may be learned by the operator of to-day. Many mines worked twenty-five to thirty years ago were improperly equipped—the science of metallurgy had not reached its present advanced stage. Mining methods were less carefully chosen, and caves in mines were of much more frequent occurrence than to-day under similar conditions. At that time machine drills were comparatively a new thing and but few were in use underground. The old Burleigh drill was the first drill to come largely into use, although several other drills of this type had been introduced previously. The name Burleigh is still indiscriminately applied by many miners to any make of machine drill. In many camps wages remain practically the same as twenty-five to thirty years ago, but mining supplies for most part are not only cheaper but better. Powder is an important item in the reduction of cost, for good powder to-day can be had for about one-third the cost of that time. Steel is better and cheaper and lights are generally cheaper, but in mining the greatest reduction in cost has been made in the application of improved methods for most cases and special methods for particular cases. Some of the old-time ideas have never been improved upon and seem unlikely to be, but in others there has been a vast change for the better. In some of the great mines which have been worked steadily for a quarter of a century or more the mining methods have been changed from time to time when it has been found that an improve-



Big Indian Mine and Mill, Near Helena, Mont. (See Page 134.)

ment could be made, until the methods of to-day are wholly unlike those at first employed. The Homestake mines, in South Dakota, furnish a striking example of this truth. In newly-opened old mines the modern ideas have usually been applied with good effect. In these cases it has not been a process of evolution from one stage to the next, but a radical change from antiquated methods, recognized as unsuited to the securing of the best results, to the most modern application of improved ideas. This, coupled with cheapened cost of supplies, power and usually of transportation, also, has made at once a paying proposition of one which never possessed the elements of profitable operation, or had ceased to possess them under the old regime. In almost every important old district of the West examples of the results obtained from this change of conditions and application of improved methods are seen. Mines which a few years ago were abandoned and classed as worthless, are to-day in operation and are proving profitable, and it has not always been a lack of proper management that has made this change for the better. Occasionally is seen a monument of folly, either in an elaborately equipped mine, with nothing to justify such equipment, or a mine possessing the elements of success which has

been managed by some one having neither practical mining experience nor business sagacity, but in most cases the management of earlier days was good, but unequal to the odds against success. The most careful management cannot make a \$3 mine pay where the actual cost is \$4. If in after years the cost is reduced to \$2, then the \$3 mine becomes a paying proposition. There are many mines working to-day which barely pay expenses, and yet which constantly offer hope of an improvement. In such mines the improvement sought must usually be found in strict, but not parsimonious, economy, and in the endeavor to extract a higher percentage of values without increasing cost, and by lessening it, if possible. In this regard the ratio of possible output to the hoisting and milling plant is of importance. It is generally more economical to operate a large than a small plant, but the size of the plant should be determined with careful consideration.

## Railroads in West Africa.

Among the most difficult engineering accomplishments of the day is the construction of railroads through the jungles of West Africa. These fore-runners, of what is hoped will be the civilization of that portion of the world, are constructed under the extreme of difficulties, through a virgin forest reeking with malaria, and where white men can only remain a short time without becoming victims of the climate. The labor is almost wholly unskilled and the difficulties of the engineering corps are ten fold those found in almost any other part of the world. These conditions render railway construction very expensive. Still, there are great latent resources in the country, including gold deposits. These have been worked in a fashion determined by the existing conditions. While it is thought that the construction of railways in that region will bring about the development of the country more rapidly, and make it possible to equip and operate mines and other industries at less expense than in the past, it is not believed that white men will ever find the climate endurable, and frequent changes in management and staff must always take place. The native workmen, however, may in time be educated to a point where they will be of far greater service than now. Notwithstanding all the drawbacks of remoteness from civilization, and fatalities due to climate, over 500 miles of railroad have been built in West Africa, through a wilderness in which there was neither highway nor trail. Rain, if not incessant, is of frequent occurrence, and much opposition from natives was encountered.



Open Cut Big Indian Mine, Near Helena, Mont. (See Page 134.)



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J. F. HALLORAN.....Publisher

SAN FRANCISCO, MARCH 4, 1905.

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THE wise mine manager is always ready to buy or install any mechanical or other device which will result in economy of operation. Some men who have the reputation of being even niggardly in their management are the first to take up any new invention or tool which is offered. An investigation will show that this tool, device or process is making a saving of money or time for that manager, and it is a compliment to his business sagacity and not a proof of his parsimonious administration. A device which will save even \$1 per day pays interest on an investment of about \$5000. The wisest mine management is he who accomplishes the greatest results at least expense of time and money without friction between employer and employee.

THE Mountain Copper Company of Shasta county, Cal., is endeavoring to find a means of economizing in the cost of copper production, and, probably, at the same time making plans which will prevent a repetition of the difficulties in which they became involved through the long-continued strike of its smelter employees. It has taken the first important step in the direction indicated by making preparations to establish a refinery at Bull's Head Point, near Martinez, in Contra Costa county, Cal. It is now stated to be the intention of the company to continue the operation of the smelters at Keswick, in Shasta county, but the making of high-grade matte and copper bars at that place will be discontinued, and, instead, low-grade matte will be the product, which will be shipped to their refinery on tide water, which is now under construction, for refining. By this means the cost of copper production will be reduced. The matte produced at Keswick will prob-

ably contain 20% to 25% copper and sufficient sulphur to make a valuable by-product in acid manufacture at its tide water plant. A scheme somewhat similar has been adopted by the Broken Hill mine of New South Wales, Australia, which is situated far inland, but which has found it advisable to place the acid plant on a seaport. The smelting operations of the Mountain Copper Company, as conducted at Keswick, is almost straight pyritic smelting, very little coke being added to the charge.

## Character in Mining.

The White Knob Copper Company's mines near Mackay, Idaho, and the Majestic Company's copper mines near Marysville, Utah, offer excellent examples of the unfortunate result of the premature equipment of mining properties. On each of these groups large amounts of money have been expended, mostly in equipment, though a considerable sum has also been spent in development, particularly in the former; but at no time in their history, apparently, have either of these properties justified the extensive metallurgical equipment found on them. A few days since the White Knob property was sold at sheriff's sale. The Majestic property has fallen into new and, it is to be hoped, better hands, and its management will probably henceforth be along more conservative lines. These mines may have great intrinsic merit; but, if so, their management has not been such as to demonstrate it. Mining has been reduced to a practical science, and, in view of the broad knowledge of all that now appertains to mining, and where no unusual difficulties in a metallurgical way present themselves, there seems small excuse for the expensive and elaborate equipment of a mine with reduction works, only to find that there is insufficient ore to supply the plant. Apropos are the words of Governor Brady of Alaska in his recent annual report, in which he condemns in unmeasured terms the policy of deceit which has apparently dominated some large recent investments in Alaska. There are instances where great sums of money have been expended fruitlessly, unless additional large sums be invested. The great mines on Douglas Island, Alaska, in a measure represent a condition of this kind. In their earlier history their milling plants were comparatively small. As mining expense increased, the profit fell off and the character of the ore changed somewhat also, and not to the advantage of the company, either. It was suggested that the mill be increased to 240 stamps. At that time the largest number of stamps under one roof was the 120-stamp mills of the Homestake Company. The directors were somewhat skeptical of the favorable outcome of such a venture; but, being assured by engineers that the scheme was entirely feasible and would result in increased profit, the investment was made and great success resulted. Since then the Alaska Company has built larger mills. In this instance the mine fully justified the elaborate outlay and it had become evident that little or no further profit could be derived from the operation if the milling facilities were not largely increased, as the handling of a much larger tonnage would reduce the cost of both mining and milling and also decrease the charge per ton for those important items which fall under the comprehensive title of general expense. A proposition of this kind is one of the most perfect illustrations of legitimate mining, while the same can not be said of those concerns which build extravagantly first and search for a mine afterward.

THE recent transfer of the control of the forest reserves from the Department of the Interior to the Department of Agriculture is important, but the privileges of miners are not apparently abridged by this change. Elsewhere herein is a letter from the Secretary of Agriculture to the chief forester, in which the matter is discussed at length. In this letter the Secretary says that the rights of way for the construction and maintenance of dams, reservoirs, water plants, ditches, flumes, etc., within and across forest reserves are granted to citizens of the United States for municipal or mining purposes, and for the purposes of milling and reduction of ores. The object of the transfer of the Forestry Bureau from the Department of the Interior to the Department of Agriculture is that the forests may be better protected from destruction and waste. As the

country becomes more populous the forests become more valuable, and there is a constantly increasing tendency to encroach upon and destroy them. It is a well known fact that in regions once covered with forests, where the water supply has been abundant, that upon the denudation of the forest the country became a semi-desert in consequence. Water is invaluable to the miner, and miners should unite to preserve as far as possible the existing forests. Despite the efforts heretofore made, there has been a vast destruction and waste of forest trees in the mountain regions of the West, and these regions are usually incidentally mining regions, or the mining regions beyond the forests depend upon the rainfall and its preservation within the forest region. With the disappearance of the forest the water supply grows short and eventually ceases almost entirely, for the "run off" is so rapid that few perennial springs are formed.

## Paying for the Privilege of Working.

Occasionally from various quarters comes the report of the demoralization of mine crews by the extortion of bosses and foremen, who, by various means, obtain money from workmen which is never repaid. In some instances bribery to secure a position is the demoralizing feature; in others, the men must patronize certain establishments about town in order to hold their jobs; in still others, on pay day the boss, or foreman, solicits a loan from certain of the men, and this loan is never repaid, nor, in many instances, is it expected. It is the foreign element among miners who are the usual victims of such practices and who submit either willingly, or sullenly hold their peace waiting for an opportunity to play even. That the best results are obtainable where such practices are in vogue is impossible. A man, having secured his position by bribe, whether it be a loan, or agreement to patronize certain trades people in the town, feels secure, and he shirks his work at the expense of the company. Miners of intelligence will not submit to extortion of this sort, and prefer to hold their places by merit alone, or to lose them if required to pay for the privilege of earning an honest livelihood. There are well authenticated instances where shift bosses have obtained thousands of dollars from the men under their direction. The management of mines should see to it that no such practices are carried on in the properties under them. It is only a few days since a number of Slavonian laborers united in a legal action to compel a former shift boss of an Alaska mine to refund money extorted from them in various ways. Of course these pernicious practices are never carried on openly, and the management remained in ignorance of the existing condition. It is thought the exposure will have a purifying effect on the mine and town as well, for men who will submit to this sort of thing do not make good or desirable citizens.

## A Successful Effort.

At the annual meeting of the California Miners' Association, held in San Francisco, Cal., last December, the debris problem was discussed at length by Prof. S. B. Christy of the University of California, who gave much detailed information on debris in rivers in general and the methods adopted for control. In accordance with the suggestion of Prof. Christy, the committee on resolutions prepared a memorial to President Roosevelt setting forth the present condition of the Sacramento and San Joaquin rivers in California, and their relation to the mining industry of that State, and soliciting his personal aid in finding a solution to the problem of caring for the debris in a manner which would permit the continuation of the mining industry without injury to other interests. The suggestion was also made that the matter be referred to the Director of the United States Geological Survey, and, in his study of the storage of flood waters and the reclamation of waste lands, give the debris problem his official attention. E. H. Benjamini, president of the California State Miners' Association, is just in receipt of information that the matter has been given consideration by President Roosevelt and that the debris problem of California will thus be taken up by the Geological Survey, and all that science and engineering experience can suggest will be done to find a satisfactory solution of the difficulty.



## CONCENTRATES.

WIRE CLOTH screens with rectangular openings have a slightly greater capacity and do not choke as readily as screens having square openings.

THE best mine timbers for general use are those which will resist the greatest thrust. Often mine timbers are also required to sustain severe bending strains.

TAMPING over dynamite is essential in securing the best results with the least powder. The explosive force of free dynamite is exerted equally in all directions.

STRAIN is a change, either of volume or form, in the relative position of the particles of a body; it is distortion when the form changes; dilation when the volume changes.

A SLOTTED SCREEN is better for flinty ores with splintery fracture than needle-pinch or wire screens. Granular ore crushes to granules and will readily pass any kind of a screen when crushed fine enough.

CHALCOPYRITE is brass yellow, pyrite pale yellow and arsenopyrite silver white to grayish. It is often tarnished to dark gray. Chalcopryite is softer than pyrite and may be easily scratched with a knife. Pyrite can not be thus scratched.

THE depth to which a hoisting engine of given capacity will operate depends upon the weight of the load and the speed at which it is intended to run it. An engine of given capacity will hoist from much greater depth at slow than at fast speed.

GOLD may be free in an ore, but occur in such an extremely fine state of division as to be invisible to the eye. This kind of gold is adapted to cyanide treatment. Often attempts to amalgamate it fail, for the reason that the ore has to be crushed so fine to free the gold that there is a heavy loss in slimes.

It is not customary to "harden" the shanks of machine drill steel, for the reason that the frequent hard usage to which they are subjected, such as pounding with a wrench or hammer, when the drill becomes flitchered, is likely to result in breaking the drill. If desired, the shank may be tempered in the same manner as the bit, by plunging at a low red heat, but it is not advisable practice.

WHERE an ore is susceptible to treatment by more than one method the surrounding conditions—transportation costs, power, etc.—should determine which process under existing circumstances should be adopted. Where doubt exists tests should be made to decide which process or class of machinery is best adapted to the conditions and character of the ore.

THE capacities of rock crushers, as given in manufacturers' catalogues, are necessarily approximate, being usually based on a hard, friable rock, fed constantly and clearing itself quickly at the outlet. The H. P. required likewise varies—1 H. P. per twenty-four hours, crushing eleven to twelve tons to  $\frac{1}{4}$  inch, sixteen to nineteen tons to 2 inches, and eighteen to twenty-two tons to  $\frac{3}{4}$  inches.

ALL cylinders, receivers and pipes of an air compressor should be frequently cleaned of accumulating oil, deposited carbon and organic dust. The air intake should be located where an abundant supply of pure, cool air may be obtained. If these precautions are not taken there is danger of the production of carbon dioxide from the heated carbon deposits. This will suffocate and kill miners, if supplied to air drills.

THE gauge pressure, when pumping against a closed valve with a multi-stage turbine pump, to be equivalent to pumping any given capacity against any vertical lift, should be equal to the total head necessary to raise the desired amount of water. This depends upon the velocity with which the water leaves the pipe, and the length, diameter and coefficient of friction of the pipe, letting Q be the number of cubic feet pumped per second.

SWITCHBOARD PANELS for electric plants are made from white Italian marble, blue Vermont marble and slate free from flaws or conducting veins. Soapstone is used for other electrical purposes, but is too soft and weak for panels. A 10,000-volt testing box is used to test for conducting veins. They are made in standard widths and heights and vary from  $1\frac{1}{4}$  inch to  $2\frac{1}{2}$  inches in thickness, according to weight of apparatus.

THE spacing between the points of water distribution on a concentrating machine of the belt type is important, for the best work is impossible if the little streams of fresh water are either too close or too far apart, though the latter is worse than the former. The distance between the points must be determined by the length of side vibration of the belt. The proper distance in most machines of this class is about  $2\frac{1}{2}$  inches.

ZINC SHAVINGS in the precipitating boxes should be changed daily, those from the lower portion of the series being moved upward as the shavings from the head box are removed for treatment. To strengthen cyanide solutions for proper precipitation, a tank or barrel may be placed at the head of the series of precipitating boxes, and the strong solution added as required by allowing it to drip slowly as the gold-bearing solution passes into the boxes.

WHERE a dam is built in a stream and the work is well and carefully done, the owner is not liable for damages which may result should the dam break away. Negligence must be shown in order to make him liable. (Losee v. Buchanan, 51 N. Y. 476, 10 Am. Rep. 623.) Dams must be so constructed as to resist such floods as might be reasonably expected to occur. (Todd v. Cochell, 17 Cal. 97; Hoffman v. Tuolumne Water Co., 10 Cal. 413; Camboll v. Bear River & Auburn W. & M. Co., 35 Cal. 679.)

METALLIC IRON decomposes cyanide solutions and this tendency is increased in proportion to the surface exposures of the metal. For this reason it is desirable to keep the amount of iron particles resulting from crushing ores for cyanidation as low as possible. A mill which has a high stamp duty produces generally less iron particles per ton of ore from shoes, dies and mortar, than one of low capacity. Some ingenious magnetic arrangements have been devised to separate a large percentage of these iron particles from the pulp as it passes over the plates from the battery.

BORAX swells upon heating. It colors the blowpipe flame yellow. Colemanite, the principal borax mineral, is calcium borate. It crumbles when heated before the blowpipe and colors the flame green. Nearly all borates impart a green color to the flame. Colemanite is colorless or white, translucent to transparent, soft (a little harder than calcite, easily scratched by a knife). When nitrates are heated in a bulb tube with potassium bisulfate, red vapors of nitric oxide are given off. Sodium nitrate colors the blowpipe flame an intense yellow. Potassium nitrate colors the flame violet.

THE main shaft of the Silver Islet mine, located on a small island near the north shore of Lake Superior, was sunk in the center of the islet—a rock about 80 feet square which projected a few feet above the water. A coffer dam was built about the island, but it was swept away by the heavy storms. This was repeated several times until a dam was built which was able to resist the action of the waves. The shaft was sunk and the mine worked to a depth of about 500 feet, and, although lying wholly beneath the level of the lake, it was one of the driest mines in America. It is at present idle.

THE purpose of a compressed air receiver is to reduce the pulsations of the air from the compressor, to collect water and grease carried by the air in the pipes. The receiver is not intended as an air reservoir of power, though to a limited extent it may be employed for this purpose, as in the event of sudden stoppage of the compressor for any cause the air in the receiver may have sufficient volume and pressure to accomplish some work, such as hoisting a skip in a shaft that had already been started by the engines, which are run by compressed air. The extent to which the receiver may be used for this purpose depends upon the volume of air and its pressure. The principle is exemplified in the compressed air motors.

IN view of the numerous accidents resulting from defective fuses, it seems strange that the manufacturers are not required to guarantee the fuses sold by them. It is true that some of these accidents charged to defective fuses are really due to the improper use of the fuse itself by the miners, and in some cases it is kept for a long time in damp magazines or in the mine, which results in premature deterioration. The date of making fuses should be stamped upon the case containing it, and also upon the paper in which the coils are wrapped. At present it appears that the only measure to protect the lives of men using blasting fuse is for the miners themselves to test the fuse they are required to use.

THE idea of pulverizing an ore sample and mixing wet with black gunpowder, forming into a cone-shaped pile, drying and burning the cone is an old one and at one time, thirty years ago, was popular with prospectors. With some copper and silver ores there is undoubtedly sufficient heat developed to cause some of the metals present to be reduced to metallic condition. The mass was then pulverized in a mortar or on a rock, washed, and the metallic particles collected by panning. In this operation the iron oxide, which may be present in the ore, and metallic particles of iron from mortar and pestle also, are fused to globules of metallic malleable iron—and these globules the prospector usually mistakes for silver or some rare metal. This method of testing ores is no better than a guess, and the experienced prospector can guess the value of his ore as closely before as after this operation. Beyond panning the free gold in an ore, it is impossible to guess what the ore may be worth, and the only reliable method is the assay made by a competent assayer. That the "aluminum welding" process would be of any value in determining the value

of ore is extremely doubtful. By none of these methods (those of mixing dry pulp with a combustible substance and burning the mixture) can reliable information be obtained, for the reason that these methods at best are crude. The metallic contents of the ore are not collected in a single globule, as in assaying, and the whole effort is a waste of time.

"THE rhombohedral" theory of jointing planes in rock was one advanced by Louis Janin, Sr., during the progress of a mining suit at Grass Valley, Cal., in which it was contended by Mr. Janin that the country rock in which the vein in dispute occurred was divided into rhombohedral blocks, by means of an auxiliary system of joints, and that this fracturing of the country rock had resulted in a certain amount of movement along these jointing planes and the formation of certain small veins called by the miners "droppers," which formed a connection between two portions of the same vein, but which had formed at one portion a sort of overlap. The section of the mine in which this occurred was a region of some disturbance. An upper vein "feathered" out, and several feet below in the footwall, what was apparently a second vein, which continued on the downward course of the vein above. These two veins were connected by these small veins running into the footwall from the vein above. It was found, however, that at a distance from this region of disturbance that the split and overlap of the main vein disappeared, and that there was simply a single vein which at one place developed this unusual peculiarity.

WHAT is known as "Schmidt's law of faults" depends for its success upon the rule, "always follow the direction of the greatest angle." By this is meant that, when a vein is dislocated by a fault, the angle formed between the vein walls and the fault plane should be observed. One of these angles is usually wider than the other, and Schmidt's law is to follow along the fault plane in the direction of the greatest angle. Thus, if a vein dips to the east at  $75^\circ$  from the horizontal, and if it be cut by a fault dipping at  $45^\circ$  from the horizon, the angle formed between the foot wall of the vein and the fault plane would be  $30^\circ$  and the angle between the hanging wall of the vein and the fault plane would be  $150^\circ$ . Then, according to Schmidt's law, the miner in search of his vein must follow along the fault plane in the direction of the greatest angle ( $150^\circ$ ), which is downward on the dip of the fault, when at an uncertain distance he will find his vein on the lower side of the fault. This so-called law is not infallible, and in the case of lateral as well as vertical displacement cannot always be relied upon. The physical condition of the wall rocks at the point of fracture often gives a hint as to the direction of throw.

THE Supreme Court of Montana said in part, in the case of the Butte & Boston M. Co. v. Societe des Anonymes de Lexington: "The right of an apex proprietor to pursue a vein passing from his side lines is dependent upon whether or not, as a fact, the part or mineral body of vein matter which lies outside of the perpendicular of the side lines of his surface claim is so preserved in its identity with the lode inside that it is part of the same vein, the apex of which belongs to the surface owner. \* \* \* On principle, the identity of the apex of a vein with its spurs and extensions must be the crucial test by which are to be fixed the proprietary rights to that vein and the mineral therein. \* \* \* The pursuit of the vein on its dip being then the right to be guarded, the identity of the vein pursued must be proven to make the right availing where it is contended the vein, after passing beyond the vertical planes drawn through the side lines of the surface boundaries of the location in which rests the apex, penetrates soil the surface of which is embraced within another location. Identity must always exist. Were there any departure from this rule, the miner might secure the benefit of more than he discovered, which was never contemplated by the law. \* \* \* Though a continuity of vein does not preclude identity of vein, yet identity does not necessarily include continuity. \* \* \* In this discussion, however, we do not mean to exclude the need of continuity sufficient to preserve identity. The application of the rule of identity should always be made so as to require the miner to trace his lode continuously if he depart beyond his extended side lines." The Supreme Court of Colorado, in the case of the Iron Silver M. Co. v. Cheesman, said: "Certainly the vein or lode must be continuous, in the sense that it can be traced through the surrounding rocks, though slight interruption of the mineral-bearing rock would not alone be sufficient to destroy the identity of the vein. Nor would a short partial closure of the fissure have that effect, if a little farther on it occurred again with the mineral-bearing rock within it." The courts properly insist upon the establishment of the identity and continuity of a vein, in pursuing the extralateral right, but identity is seemingly more important than continuity. It is admitted that the identity of a vein may be clearly shown in the case of a moderate dislocation by a fault, but the courts have never determined to what extent a vein may be faulted. There are known instances where a mineral vein or bed is faulted and the point where the fault commences is known. The displacement at first is small and the identity of the vein is positive, but half a mile distant it has become a fault of considerable importance and the ore body is dislocated by several hundred feet. An instance of this kind was found in the Little Cottonwood Canyon district of Utah.



## Trials of a Millman.

TO THE EDITOR:—In your issue of February 18th, I find a very interesting and instructive article on the trials of millmen, with some suggestions of means and methods for their relief and improvement in savings made in milling.

While I fully agree with the facts as stated, and with the suggestions made for benefiting the conditions, I think the writer might have gone further and been more explicit in defining the application of the methods advised, as they are all unquestionably along the right lines and are the most prevalent and important omissions in the construction and equipment of the modern mill.

Admitting and affirming that all the difficulties of different constituency of ores and of correctly sampling same exists in every mill, and that an even supply of water to the battery is important for all purposes, the crushing will not only produce coarse sand and slimes, but a product with a great variety of size and gravity of particles, for which a classification is absolutely necessary, not only separating the coarse and slime, but also segregating the different specific gravities, which, to be complete and effective, will require from six to ten sizes—the requisite number to be determined by the millman.

My experience has been if you ask the millman what percentage of different mesh pulp his batteries are producing, that nine out of ten will answer that they do not know—have never realized the necessity of knowing. But how can he tell what classification is necessary unless he does know, and how can he find out?

A very simple method that I have adopted is to take a nest of small screens, ranging from the mesh used on the battery in graduations of 20 mesh up to 200 mesh, place them in a column with the coarsest at the top, on slats over a tub, catch several buckets of pulp without allowing any to run over the top of the bucket and turn through the screens; then follow with a little clear water for cleaning purposes. Then separate the screens and weigh what is caught on each screen, settle and evaporate the water in the tub, and weigh the slime it contains. From the data obtained you can arrange your classification according to the number of your tables, in graduations of 20 or 40 mesh, from one table to the other, and know what proportion of the whole each table should receive.

The means of classification are of the greatest importance, and should be such as will produce the most favorable conditions for good work by the tables, which are:

First—Accurate sizing of particles according to specific gravity for each table.

Second—The regulating of water with each size to the least amount that will effect the separation on the table.

Third—To maintain absolutely even feed of both pulp and water to each table.

It is almost impossible to prevent some variation of discharge at the battery on account of some clogging of the screens by fine dirt and clay, and the necessity of frequently using the hose to wash them out and wash down the plates. Therefore, a sizer or classifier that works with a large volume and head above the draughts to the tables is most efficient, as the variations will not be felt; also, one by which the quantity of water coming from the battery and plates can be reduced instead of increased, and no loss of slimes go with the overflow.

This is one objection to this system of classification, the added water at each cone passing on and discharging with the finer sizes, where it is not wanted, and where the use of the smallest amount possible is of the greatest importance in effecting a high saving.

The regulating of the speed, which the writer demands, is of such great importance that no care and reasonable outlay should stand in the way of supplying it, and where steam power is used, a separate engine should, if possible, be provided and nothing but the concentrating tables be driven by it.

It is also of the greatest importance that not only a uniform speed be obtained (as the writer maintains), but, when the proper sizing and classification is had, means should be provided for graduating the speed of each table to the class of pulp it is handling. The use of an expansion pulley for each table, placed between the countershaft and the table, is very convenient and effective, and those who have not used them will be astonished when they do to see what effect even four or five strokes a minute will have on the action of a table.

The regulation of the stroke also has a decided effect on classified pulp. In concentrating without classification, the range of adjustment is limited, and the saving is also limited. The millman, who devotes the most study to conditions and the greatest care in application of method, will be the most successful; and the mine and mill owner, who secures the best man and gives him carte blanche in equipping the mill, will make the most money.

Los Angeles, Cal., Feb. 27. J. O. DIMMICK.

## New Rules for Forest Control.

Throughout the mining regions of the West the preservation of the forests is of greatest importance, and the laws and department rulings having a bearing on the use of the forests and their preservation are of interest to all mine owners. Following is a letter from the Secretary of Agriculture to the Forester, which gives the latest official information on this important subject:

TO THE FORESTER, FOREST SERVICE—SIR: The President has attached his signature to the following Act:

"An Act providing for the transfer of forest reserves from the Department of the Interior to the Department of Agriculture.

"Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of the Department of Agriculture shall, from and after the passage of this Act, execute or cause to be executed all laws affecting public lands heretofore or hereafter reserved under the provisions of section twenty-four of the Act entitled, 'An Act to repeal the timber culture laws, and for other purposes,' approved March third, eighteen hundred and ninety-one, and acts supplemental to and amendatory thereof, after such lands have been so reserved, excepting such laws as affect the surveying, prospecting, locating, appropriating, entering, relinquishing, reconveying, certifying or patenting of any such lands.

"Sec. 2. That pulp wood or wood pulp manufactured from timber in the district of Alaska may be exported therefrom.

"Sec. 3. That forest supervisors and rangers shall be selected, when practicable, from qualified citizens of the States or Territories in which the said reserves, respectively, are situated.

"Sec. 4. That rights of way for the construction and maintenance of dams, reservoirs, water plants, ditches, flumes, pipes, tunnels, and canals, within and across the forest reserves of the United States, are hereby granted to citizens and corporations of the United States for municipal or mining purposes, and for the purposes of the milling and reduction of ores, during the period of their beneficial use, under such rules and regulations as may be prescribed by the Secretary of the Interior and subject to the laws of the State or Territory in which said reserves are respectively situated.

"Sec. 5. That all money received from the sale of any products or the use of any land or resources of said forest reserves of the United States, and for a period of five years from the passage of this Act shall constitute a special fund available, until expended, as the Secretary of Agriculture may direct, for the protection, administration, improvement, and extension of Federal forest reserves.

"Approved February 1, 1905."

By this Act the administration of the Federal forest reserves is transferred to this Department. Its provisions will be carried out through the Forest Service, under your immediate supervision. You have already tentatively negotiated the transfer with the Commissioner of the General Land Office, whose powers and duties thus transferred I assign to you. Until otherwise instructed you will submit to me for approval all questions of organization, sales, permits, and privileges, except such as are entrusted by the present regulations to field officers on the ground. All officers of the forest reserve service transferred will be subject to your instructions and will report directly to you. You will at once issue to them the necessary notice to this effect.

In order to facilitate the prompt transaction of business upon the forest reserves and to give effect to the general policy outlined below, you are instructed to recommend at the earliest practicable date whatever changes may be necessary in the rules and regulations governing the reserves, so that I may, in accordance with the provisions of the above Act, delegate to you and to forest reserve officers in the field, so much of my authority as may be essential to the prompt transaction of business, and to the administration of the reserves in accordance with local needs. Until such revision is made, the present rules and regulations will remain in force, except those relating to the receipt and transmittal of moneys, in which case Special Fiscal Agents of this Department will perform the duties heretofore rendered by the Receivers of Local Land Offices in accordance with existing laws and regulations. The Chief of Records, Forest Service, is hereby designated a Special Fiscal Agent, and you will direct him at once to execute and submit for my approval a bond for twenty thousand dollars.

On December 17, 1904, the President signed the following order:

"In the exercise of the power vested in the President by Section 1753 of the Revised Statutes and acts amendatory thereof:

"It is ordered, That all persons employed in the field and in the District of Columbia in the protection and administration of forest reserves in or under the General Land Office of the Interior Department be classified and the civil-service Act and rules applied thereto, and that no person be hereafter appointed, employed, promoted, or transferred in said service until he passes an examination in conformity therewith, unless specifically exempted thereunder. This order shall apply to all officers and employees, except persons employed merely as laborers, and persons whose appointments are confirmed by the Senate."

This order classifies the whole Forest Reserve Service, now transferred, and places it under the civil service law.

In the administration of the forest reserves it must be clearly borne in mind that all land is to be devoted to its most productive use for the permanent good of the whole people and not for the temporary benefit of individuals or companies. All the resources of forest reserves are for use, and this use must be brought about in a thoroughly prompt and business-like manner, under such restrictions only as will insure the permanence of these resources. The vital importance of forest reserves to the great industries of the Western States will be largely increased in the near future by the continued steady advance in settlement and development. The permanence of the resources of the reserves is, therefore, indispensable to continued prosperity, and the policy of this Department for their protection and use will invariably be guided by this fact, always bearing in mind that the conservative use of these resources in no way conflicts with their permanent value. You will see to it that the water, wood and forage of the

reserves are conserved and wisely used for the benefit of the home builder first of all, upon whom depends the best permanent use of lands and resources alike. The continued prosperity of the agricultural, lumbering, mining and live stock interests is directly dependent upon a permanent and accessible supply of water, wood and forage, as well as upon the present and future use of these resources under business-like regulations, enforced with promptness, effectiveness and common sense. In the management of each reserve local questions will be decided upon local grounds. The dominant industry will be considered first, but with as little restriction to minor industries as may be possible. Sudden changes in industrial conditions will be avoided by gradual adjustment after due notice, and where conflicting interests must be reconciled the question will always be decided from the standpoint of the greatest good to the greatest number in the long run.

These general principles will govern in the protection and use of the water supply, in the disposal of timber and wood, in the use of the range, and in all other matters connected with the management of the reserves. They can be successfully applied only when the administration of each reserve is left very largely in the hands of the local officers, under the eye of thoroughly trained and competent inspectors.

JAMES WILSON, Secretary of Agriculture.

## Electrolytic Chlorination Process.

TO THE EDITOR:—In the issue of the MINING AND SCIENTIFIC PRESS of February 4, 1905, appears a reference to our treatment of the ores of the Ruby Mining Co. on Chopaca mountain, near Nighthawk, Okanogan county, Wash. Believing that this innovation in metallurgy will be of interest to many of your readers, we append the following details of the process:

The ore is crushed fine enough for a tube mill, dried and put in a hopper suitable to feed into the tube. This tube mill has inlet for chlorine at one end, and outlet for volatile substances (such as sulphur, arsenic and antimony) at the other. It is half filled with flint pebbles and the ore admitted. At the same time chlorine is admitted at the opposite or outlet end. Heat is applied, and the volatile chlorides, such as sulphur-chloride, are driven out and condensed. As the chlorine comes in contact with the ore all the base metals and the silver form chlorides. As the material reaches the outlet spiral, it is discharged into vats for leaching. The vessel then contains gangue mixed with free gold, and the chlorides of lead, silver, copper, zinc and iron. It is then leached with chlorine water for the purpose of dissolving gold. The solution then contains the chlorides of gold, iron, copper and zinc, and is then passed through cement copper to precipitate the gold; then is passed over granular zinc, and the copper is precipitated. The solution is then chlorinated again to make all iron present ferric. Then zinc oxide is added to precipitate the iron. The solution is filtered and then contains only zinc chloride which is electrolyzed to obtain chlorine and zinc.

The gangue that was left from leaching the original mass contains chlorides of lead and silver. It is then leached with hot brine to dissolve these chlorides, and when the solution becomes cold, the lead chloride and most of the silver chloride precipitates. The brine is then purified with sodium sulphide, which precipitates all the lead and silver as sulphides, which are then ready for cupellation. The lead and silver chlorides that were precipitated from the cooling brine may be fused and separated by molten lead and molten zinc, giving lead and silver as metals and zinc chloride as end products.

Zinc chloride yields zinc and chlorine by electrolysis from aqueous solution, or from fused mass. The chlorine is then returned to reduce more ore. For the purpose of starting, and to cover waste, chlorine is first obtained by the electrolysis of salt from solution, and at the cost of such power, as we understand this mine has, the expense will be about one-quarter of a cent per pound. The sulphur chloride will give up its chlorine to the pulverized ore and decompose it, giving all its sulphur in the free state, so there is not much loss of chlorine. The sulphur can be distilled from the gangue.

The ore of this mine according to the sample sent us analyzed as follows:

	Per Cent.
Insoluble gangue.....	79.350
Lead.....	0.333
Copper.....	5.180
Iron.....	2.716
Aluminum oxide.....	3.790
Antimony.....	0.252
Arsenic.....	0.553
Zinc.....	2.121
Calcium oxide.....	0.680
Magnesium oxide.....	0.254
Sulphur.....	3.786
Total.....	99.355
	Ounces.
Silver.....	596.46
Gold.....	.07

From the above, the complex character of the ore is manifest. Our process requires no concentration. Cleveland, O., Feb. 20. BAKER & BURWELL.



### Jeffrey Flexible Cable Car Haul.

Herewith is illustrated the wire cable car haul as installed by the Jeffrey Mfg. Co. at the works of the Beckley Coal & Coke Co., Beckley, W. Va. The wire cable haul, as illustrated, being flexible, can be used in short hauls, and is asserted to be of even greater



Jeffrey Flexible Cable Car Haul.

utility where the distance or length of haul is great.

At the Beckley plant the distance from the gathering point in the mine to the tippie is 350 feet. In this operation a single steel cable is used, which passes over an adjustable special cable wheel in the mine, while at the tippie it operates over two sheaves, connecting with a third located immediately underneath, which is set at right angles. These cable wheels are made with pockets which receive the special cable attachments and carriers, which are guided over, down and around the lower wheel, which acts as the main drive to the whole system. The features especially emphasized by the manufacturers are its design, the special dogs which are attached to the cable for carrying the car, the special clamps and the adjustable cable sheaves, all being protected by patents issued and pending and common only to Jeffrey installations. The Beckley plant is designed for a capacity of 2400 cars (each with a capacity of 1½ ton of coal) in ten hours. Special printed matter on this subject can be had by addressing the Jeffrey Mfg. Co., Columbus, Ohio.

The first large electric hoist for deep level mining on the Rand has been ordered for the Village Main Reef mine at Johannesburg. It will be placed at a vertical depth of 1100 feet, and will haul on a 1700-foot incline. The generating plant will be of 900 H. P., and the hoist of 500 H. P. From the 1100-foot level skips will be hoisted to the surface as formerly.

### Magnetite in the Blast Furnace.

To THE EDITOR:—Answering your note in your issue of the 4th inst. regarding the use of magnetite in the copper smelting blast furnace, I beg to say:

We are using this material as a flux or "dope" in the furnaces of the Montana Ore Purchasing Co. here in Butte, and have none of the troubles mentioned in the article quoted. Our material is a hard, solid magnetite, carrying usually 55% Fe and about 11% SiO<sub>2</sub>, much of this being contained as silica tes. The material is crushed to pass an ordinary 10x30 Blake crusher and then fed to the furnaces as needed.

I say it is used as "dope" rather than as flux. That means that we do not have to rely on this material for the iron for our matte, nor for all the iron for our slags, either, this iron being obtained from the coarse concentrates from the regular copper ores. The magnetite is used at irregular intervals, when in the judgment of the blast furnace foreman the condition of the furnace bottom, or the slags, indicates that a dose of iron will help the slags or speed the furnace up. This it does, and we see no difference in the action of this material on our furnaces over that obtained from the use of hematite. When used at all the magnetite is fed into the furnace 1000 pounds at a time, and during one day as much as six or eight tons is frequently fed to one furnace.

This would not represent an average, but illustrates the amount which may be used under our conditions without showing the bad features mentioned by your correspondent. In order that the proportions may be better appreciated, it is safe to say that the furnaces average about 150 tons of ore and about 300 tons of total charge (exclusive of coke) in twenty-four hours.

JAMES W. NEILL.

Butte, Mont., Feb. 21.

To THE EDITOR:—Replying to your inquiry of the 23rd ult., would state that the magnetite to which Mr. Lindgren refers, in "Genesis of the Clifton-Morenci Copper Deposits," was successfully used by us as a flux for a number of years in the smelting of oxidized ores for black copper. We have not used it in smelting for copper matte, otherwise we would have probably encountered the trouble you refer to.

JAMES COLQUHOUN,  
Arizona Copper Co.

Clifton, Ariz., Feb. 25.

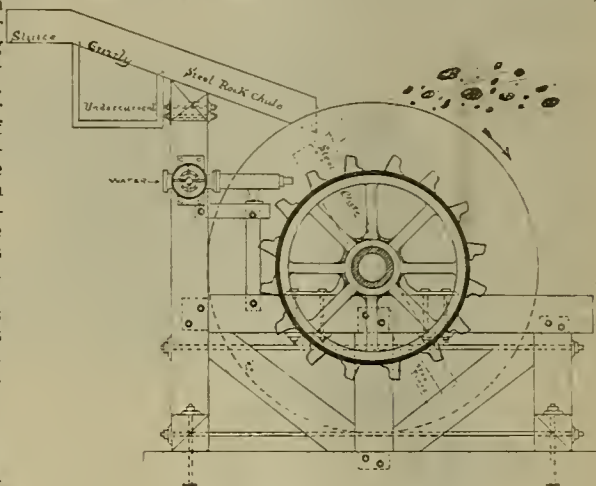
### Gas Engine Hoist.

The accompanying illustration shows an 8 H. P. gas engine hoist built by the Corliss Gas Engine Co. of San Francisco, Cal. It was especially designed for a miner's prospecting plant, and has a hoisting capacity of 1500 pounds 160 feet per minute. The drum and the frame to which the engine is bolted are of steel, and wherever possible steel has been used in place of cast iron. This engine is operated with either gasoline, distillate or crude oil, and, it is claimed, can be run on less than 1 cent per horse power hour. A pulley is fitted to the shaft, which can be used for pumping, sawing and all general purposes. The weight is 2500 pounds.

Good mining records are obtainable by the employment of careful and experienced management, good machinery and good men. The best manager is he who properly accomplishes results at the least cost, whether these results are profitable or not. Managers of rich mines get more credit than they are entitled to, while the careful manager of a poor property is, as a rule, damned by faint praise.

### A Tailing Stacker for Hydraulic Mines.

The machine shown in the illustration is designed to handle the tailings from hydraulic mines, throwing the material 75 to 100 feet from the machine and stacking it from 40 to 60 feet high, and is also designed to handle boulders 10 inches in diameter. Its stated capacity is 2000 yards per day. It is placed at the end of the sluice, with a grizzly interposed between the sluice and the rock chute. The water and fines drop through the grizzly into the undercurrent, where the fine gold is saved, and the water carrying matter in suspension is run onto the ground or into settling ponds, according to location and conditions. In operation a stream of water sufficient to develop 35 or 40 H. P. is conducted to the water wheel attached to the shaft of the machine,

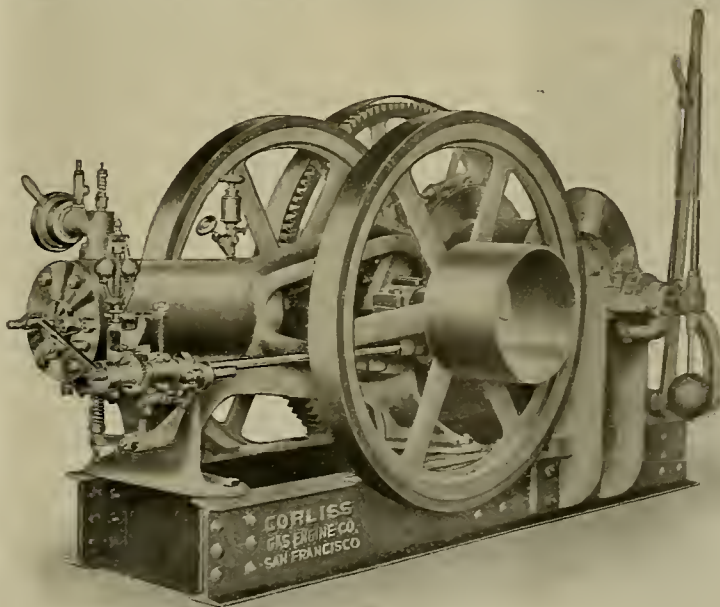


Tailing Stacker for Hydraulic Mines.

which runs at the rate of 250 revolutions per minute. The shaft is mounted in acme roller bearings, which need lubricating but once in six months and reduce the horse power necessary to operate the stacker. The manufacturer states that the machine can be set so that the material can be thrown in any direction or at any angle. It is made entirely of steel. The steel plates, where the greatest wear occurs, can be renewed at small expense and the construction permits of easy transportation. It is claimed that where a dump of 6 or 8 feet can be obtained the machine can be used, as the material is thrown back of the machine and onto the ground already worked. As the bank is worked the machine is moved, the length of the sluice remaining the same and the bank followed up.

The low dump permissible makes it possible to work many good hydraulic mines that are now idle on account of insufficient dump. It is also adapted to mines where a dam acceptable to the California Debris Commission cannot be built. The material discharged from the stacker forms a harrier or dam through which the water used in hydraulicking must percolate, thus reaching the stream, if there be any, virtually free from slickens or other matter in suspension.

The machine can be run by steam or electric power, the cost of installing, operating and maintaining being stated to be less than that of a good dam. It is also adapted to dredgers. This machine is manufactured by H. G. Comstock, 230 Montgomery street, San Francisco, Cal.



Gas Engine Hoist.



### Innovation in Tunnel Work.

Some of the most interesting mining engineering work undertaken in America has been done in and about the city of New York. Among the notable engineering works completed and in progress there are the new Croton aqueduct, the tunnels beneath the Hudson river, the rapid-transit subway recently completed, and the driving of a new railway tunnel in the borough of the Bronx. The latter work is thus briefly described in the Engineering News:

As a part of the depression and rectification work on the Port Morris branch of the Harlem division of the New York Central & Hudson River Railroad, a short tunnel is being driven under St. Mary's Park. The park is near 149th street and St. Ann's avenue, in the borough of the Bronx, New York City.

The two most interesting features of this tunnel work are the location and loading of drill holes, and the loading of muck with a steam shovel operated by compressed air. Steam shovels have been used before in tunnel work, but never, so far as we know, within the limits of Greater New York. The gneiss and mica-schist of New York break out in much larger chunks than the shales and sandstones of Pennsylvania, where steam shovels have been used in tunneling, and for this reason the spacing of the drill bores and the charging of the holes on the St. Mary's Park tunnel work will be of particular interest to contractors and engineers as furnishing a precedent for similar work in tough rock.

The top heading, Fig. 1, was first driven from

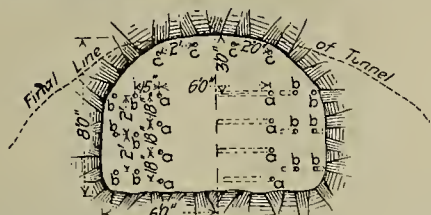


Fig. 1—Front View and Plan of Holes in Heading.

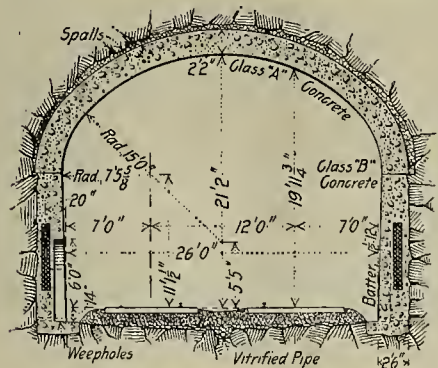


Fig. 2—St. Mary's Park Tunnel Section.

portal to portal, its dimensions being 8x12 feet, and the position of the drill holes being as shown. Both dynamite and joveite were used in the heading blasting—the dynamite being 60%, and the joveite of an equivalent grade. There was no material difference in the work done by the two kinds of explosives, pound for pound, and the average amount used was six pounds per cubic yard of rock. The heading averaged 4 cubic yards per linear foot.

The bench is being taken out in two lifts, as shown in Figs. 3 and 4, the upper lift or bench being kept just in advance of the lower bench. Two rows of holes are drilled in each bench, charged and fired in the order shown, the "a" holes being set off in the first blast, then the "b" holes, then the "c" holes. The resulting breaking up of the rock is excellent; the writer has never seen a better example of heavy blasting in a tunnel. The huge muck heap is attacked by a steam shovel, Marion Model 20, having a yard dipper. Before blasting, the shovel is hauled back about 100 feet by a line from the hoisting engine which handles the muck cars. These cars are each 5 cubic yards capacity, and average about 2½ cubic yards of solid rock per load. They are hauled out in trains of two by a hoisting engine, located in the approach cut, and up an inclined track supported on blocking and trestle, having a sufficient rise to carry the empty cars back by gravity. As soon as the loaded train passes out of the tunnel the

empty train rushes in. The muck is lifted in skips by a derrick located on the bank above the approach cut, and dumped either into cars or into a dump heap. This dump heap is used as a stock pile for

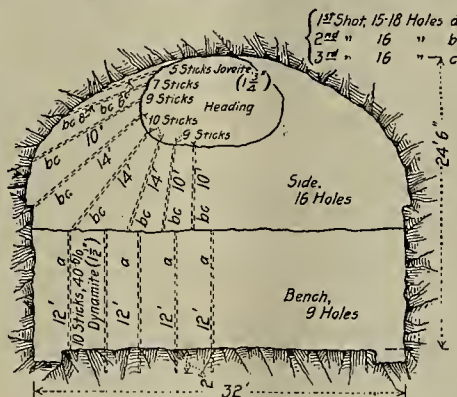


Fig. 3—Front View of Holes in Benches.

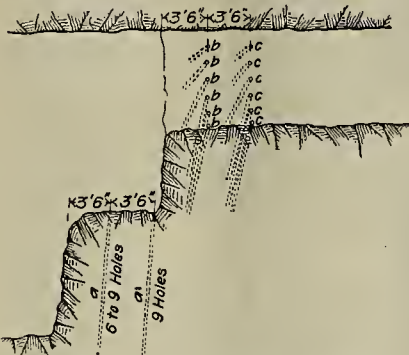


Fig. 4—Side View of Holes in Benches.

the crushing and concrete mixing plant. The shovel is now working about 350 feet from the south portal of the tunnel and is giving perfect satisfaction. The crew operating it consists of the two shovel men, four pit men and a pit boss.

### Getting Subscribers.

Some of the experiences of our corps of subscription solicitors throughout this west half of America makes interesting reading at times. The following is part of a recent letter from a Colorado subscription solicitor. It was not written for publication, but furnishes a good illustration of part of the work on a technical journal of which little is ever said. Just as part of the day's work he writes:

I left Breckenridge in the afternoon, walked 8½ miles to the Quandary mountain mill, where I stayed over night; next morning started for the Ling Star mine, on North Star mountain. As the crow flies this mine was 2½ miles from the Quandary mountain mill; as I had to go it was considerably farther. Instead of following the wagon road over Hoosier pass I went up the side of the mountain, catching hold of bushes and trees to keep from rolling back. After an hour I landed on top of a mesa, or plateau, and struck a trail up the side of the mountain to the main trail to the mine. When I reached the main trail I was in Park county, on the southern slope of North Star mountain, but close to the top. For over 3 miles I followed this jack trail over the rock slides and snow banks. The trail was built close to the summit of the mountain, but on the south side and all the way in a rock slide. About a mile from the mine I saw a man a short distance below and waited until he came up. He proved to be the mine foreman on his way to the mine. We traveled together along this trail to the top of the mountain, and then a zig-zag trail down on the north side of the hill to the mine. At 11 o'clock we got to the boarding house, where I had dinner. At 1:30 p. m. I started for Alma, 10 miles distant. Instead of going back by the trail I left the trail at the top of the mountain and went down the south side of the hill to another mine in operation at the foot of the mountain in the canyon. Leaving this place I started down the canyon for my destination, stopping on my way at a mill at Montgomery, and so on to Alma, having walked up hill and down and in rock slides a distance of 14 miles. But I got what I went after.

Of course, the scenery was grand, and that made me forget how tired I was. On the north side of North Star mountain, and 3000 feet below the Ling Star mine, is Blue lake, the headwaters of Blue river, which flows toward the Pacific. On the south side was the headwaters of Platte river, which wends its way to the Atlantic. I was on the continental divide, or backbone of the continent (a great place to find subscribers, but that is the place they usually get). Some of the rock dumped from the Ling Star mine finds its way down to Blue lake. It makes a fine dumping place.

### Revival of Mining at Unionville, Mont.\*

In the early days of mining in Montana, one of the most noted districts was that about Unionville, in the vicinity of Helena. After a number of years of active mining, during which the placers of Alder gulch added many millions to the gold production of Montana, and such mines as the Whitlatch-Union, Snowdrift-Penobscot, and other mines became famous, there came a period of inactivity. This section is now the scene of a marked revival of the mining industry, and the following from the report of the Montana State Inspector of Mines, James Byrne, soon to be issued, is of interest in this connection:

For a period of ten years, beginning in 1867, there was great activity in quartz mining in the vicinity of Unionville, and it centered around the Whitlatch-Union mine, discovered by James Whitlatch, and later worked by the National Mining & Exploring Co.

This company is credited with having taken out over four millions of dollars in seven years. In 1877 the mine closed down, and was allowed to fill with water. Subsequent operations were confined to the territory which the water did not cover, and leasers or tributaries worked whatever could be most easily reached—the pillars of ore which yet remained in the mine, and the waste in the stopes, which, by sorting, yielded good wages to the men thus employed.

Almost every summer since the company operations were suspended, the old 10-stamp mill has been at work, part of the time, crushing the ore taken out of the mine by leasers the preceding winter. This accounts for the fact that Unionville has never been entirely deserted, quite a number of people gaining their living wholly or in part out of this mine. And now the old camp bids fair to be one of the best of the smaller camps in the State.

Union Hill occupies the divide between Oro Fino gulch and Grizzly gulch 4 miles south of Helena, and through this hill runs the belt of East and West lodes which furnished the gold to the wonderfully rich placer diggings of Last Chance gulch. The Union Lode may therefore be justly termed the "Mother" of the placers round about Helena, to the amount of \$28,000,000. Both Oro Fino and Grizzly gulches have a general northerly course, cutting the lodes or veins at nearly right angles, and it is plain that by the simple process of denudation, the quartz of the vein was made to give up the free particles of gold, which so enriched the gravels of Last Chance gulch, lower down.

Of all the veins cut by these gulches, the Union No. 2 vein, constituting the central portion of the property of the Whitlatch M. Co., was the richest vein, and produced the most money in the shortest time. At one time there were seven stamp mills in operation in and around Unionville, and the ore mined to supply these mills was always from the smaller and richer streaks of quartz, while the large masses of low grade ore were passed by, and could not be handled, owing to the lack of a suitable and cheap process of treatment. The cyanide process now affords a remedy for this lack of utilization of the great mass of mineralized granite lying between the veins, as well as the low grade vein stuff which has hitherto been thrown aside as waste.

The Big Indian mine, on the same belt, 2½ miles further east, has demonstrated with its economically run 60-stamp mill, that a very low grade material can be made to pay a profit, and has had much to do with setting the pace for other mining operations on the "Mother Lode" of the Unionville district.

The contact between the limestone and the granite occurs on the northerly side of Union Hill, and has a general east and west course, crossing both Oro Fino and Grizzly gulches, and the mineralized belt in the granite lies to the south of this contact, and is an average distance of one-half mile away from it.

The same class of lodes extends over into the "Park," as the locality west of Grizzly gulch is known. Here development has never gone more than 200 feet in depth, and, whenever what would now be called a very moderate flow of water was encountered, work was suspended. A number of independent operations on the Park lode, which appears to be the western extension of the Union lode, were conducted up to the year 1880, but none of them did more than scratch the surface, and mill the ore from richer vein streaks easily accessible.

When, in the spring of 1904, Canoll & Martin began operations upon the Whitlatch mine, a new impetus was given to mining in the vicinity of Unionville. Having secured the property of the National Mining & Exploring Co., as well as a number of adjacent claims, they began in May, 1904, under the direction of Frank L. Sizer, who is general manager of the new company, the sinking of a vertical two-compartment cage shaft, and on Nov. 8th, it had been sunk to a depth of 415 feet. Since that time vigorous development by drifting on the vein has been in progress, with what are understood to be favorable results.

As the old inclines by which the National Mining & Exploring Co. had worked its mine were in a dilapidated condition, it was deemed best to sink a

\* See illustration on front page.



new shaft at a point where none of the old workings would be directly encountered, and development has proceeded as if the ground were virgin. The wisdom of this policy has already been demonstrated, and as the old workings had reached a depth of not more than 300 feet, vertical from the surface, considerable new ground has already been opened by the new 400-foot shaft. A considerable flow of water has already been met with, and more is expected when the various levels shall have opened more ground on the vein. A No. 9 Cameron pump at the 300-foot station, and a No. 7 sinking pump at the bottom, are kept in constant operation to handle the water.

The surface plant put upon the Whitlatch mine, by the new company, consists of a pair of boilers, a double cylinder first motion hoisting engine good for 700 feet of depth, a four-drill straight-line air compressor, covered with a substantial iron roofed building. Adjacent to this are blacksmith shop and carpenter shop, with boarding house, bunk house and office building, all new, and thoroughly built.

There is an old 10-stamp mill on the property, which has thus far not been operated by the new company. It is expected that with further favorable development in the mine, the company will be in a position to start the construction of a new and modern mill by the summer of 1905. It will be a plate mill, combined with cyanide treatment for the tailings, but the size has not yet been determined. It is expected that the additional recovery of value from the ore over the old style of milling in vogue at the time the mine was closed down, in 1877, will constitute in itself a very fair profit on the whole operation.

Future development of the Whitlatch mine will be watched with interest, and as work goes on, there will be, unless all signs fail, encouragement to other mining operations in the vicinity of Unionville, and an era of prosperity for the whole neighborhood may be reasonably looked for.

### Gold Dredge Efficiency.

TO THE EDITOR:—I have read with much interest the abstract of the annual report of the Oroville Gold Dredging & Exploration Co. in your valued issue of February 18. It contains figures of the greatest possible value to the dredging industry. There is only one point which appears to need further data to make it valuable. Under the head of extraction the report reads as follows:

"The prospect value of the dredged area, based on the average value of the holes in and near the dredged area, was 16.64 cents. The extraction table herewith attached, which is computed on these figures, makes the extraction 74% of the prospect value."

I take this means of asking Superintendent C. H. Munro what equivalent diameter he used when calculating the results of his original prospecting, so that the mining and engineering profession in general may have the benefit of his reply. Without this explanation the majority of readers would get the impression that the gold-saving efficiency of dredges did not exceed 74%, forgetting that the total efficiency is subject to two factors, one being the quality of bedrock (this factor being to a large extent independent of the dredge), and the other the actual efficiency of the separating and gold-saving devices used. This, in the case of the Risdon tables and revolving screen, with which I have had the most experience, is certainly far above 74%, as proved by assaying the tailings from the stern of the dredge. The combined efficiency or percentage saved of the actual value in the ground cannot be calculated, except approximately, owing first to the impossibility of arriving at a definite diameter to represent accurately the actual amount of ground taken out by the sand pump per foot of hole drilled, and secondly because the amount actually treated bears such a small percentage to the ground dredged that results averaged from the prospecting can only be approximate. In the above I do not wish for a moment to imply that prospecting properly done does not give a very close approximation to results which can accurately be obtained in dredging. I have known engineers, prospecting with a 6-inch drill, take as a basis of calculation diameters varying from 6 inches to 8½ inches to represent what they considered the actual area of ground taken out by the sand pump. Under exactly similar conditions, if the dredge showed an extraction of 50% when a 6-inch hole was used as a basis, it would have shown 100% extraction if the basis had been 8½ inches. To arrive at a close approximation of what may really be expected from a dredge, given a bedrock which can be cleaned up, and systematic and careful prospecting, I have kept careful records of various experiments of large quantities of ground, and have evolved the following formula:

Let  $c$  = value of gold in cents taken out of prospect hole;  
 $d$  = depth of hole in feet;  
 $v$  = value per cubic yard in cents which dredge ought to recover;  
 then  $v = \frac{100 \times c}{d}$

The constant 100 is an arbitrary figure, but it will

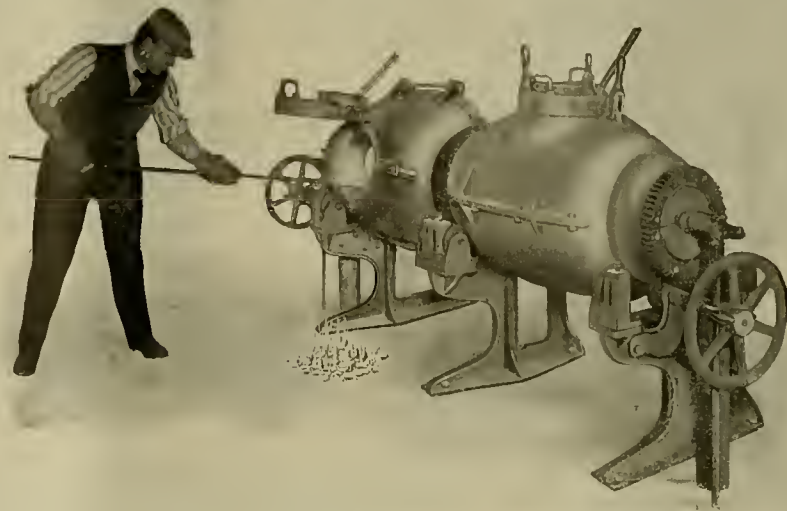
be found to represent approximately a 7-inch diameter.

If Mr. Munro will give the data on which he based his prospecting it will be greatly to the benefit of all dredge operators, as the more data proved up by actual results the better, and the combined experience may modify the constant given in the above formula—to make it agree more closely with average results.

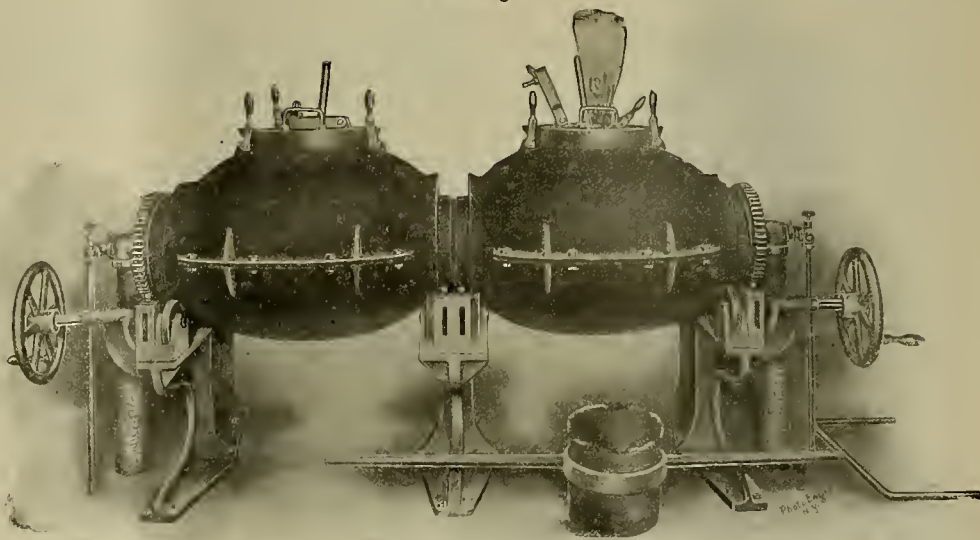
R. H. POSTLETHWAITE.

### Rotary Melting Furnace.

The Rockwell rotary melting furnace is constructed with two independent chambers, located end to end, communicating with each other and having a burner



Skimming.



Rockwell Rotary Melting Furnace.

at each outer end. The chambers are mounted on legs resting on a base; both chambers charged with metal. One burner is operated at a time, firing and melting occurring alternately from left to right and from right to left. The spent gases escape from the live or primary chamber through the neck into the secondary chamber, where the heat is partly absorbed by the charge of metal in that chamber before being discharged into the open air. When the live chamber has completed its melt the fire is reversed, the secondary chamber becoming the live chamber. This operation of alternately charging, melting and reversing may be continued indefinitely. The two chambers forming the complete furnace are of steel; they are divided longitudinally through their axis, hinged on one side and bolted together through their flanges as shown. Each chamber at its center has a port for charging and pouring the metal. Each port has a hinged, tight fitting steel cover, held down during operation by two steel clamps. Each cover has a vent opening through its center which may be closed by a hinged cap and clamp. The chambers are mounted horizontally on rollers; the outer ends provided with worm gears and hand wheels for revolving and pouring. An oil or gas burner is placed at the outer end of each chamber. The burners are permanently fixed in position, are provided with valves and unions and can be easily removed if desired. The chambers are lined with a refractory material rammed in bulk into the half shells separately around a form, as sand is rammed around a pattern in a mould. The forms are then removed,

the shells closed after the fashion of a clam shell, and the linings are burned in place in the furnace from the heat of the burners.

In addition to melting brass, bronze and copper, it is designed for melting the product of the cyanide plant with intent to make it possible for the cyanide operator to reduce the product. The Pacific coast representative is J. C. Martin, Jr., 117 New Montgomery street, San Francisco, Cal.

STAMPS weighing 1000 pounds were used in California at the Allison Ranch mine, near Grass Valley, as early as 1870, also at the Rocky Bar mill. The Sierra Buttes mill, near Downieville, had twelve stamps of 640 and 600 pounds respectively. The drop was from 9 to 12 inches, sixty to sixty-seven drops

### Flodin Self-Oiling Wheel.

Herewith is illustrated the Flodin self-oiling car wheel, showing its general design. The annular chamber formed by the two webs is connected by two slot cores with the bore of the wheel. This chamber is filled with cotton waste, wool, or similar material, which can be readily soaked with oil. To oil the wheel the pipe plug is unscrewed and the waste in the chamber soaked with oil. These wheels are manufactured exclusively by the Lake Shore Engine Works, Marquette, Mich.



Flodin Self-Oiling Car Wheel.

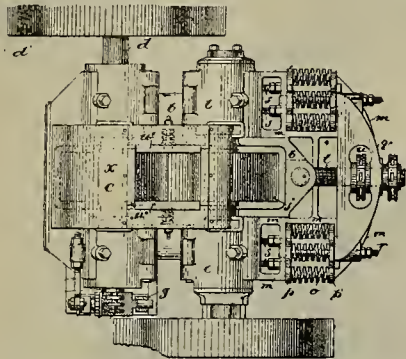


## Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 21, 1905.

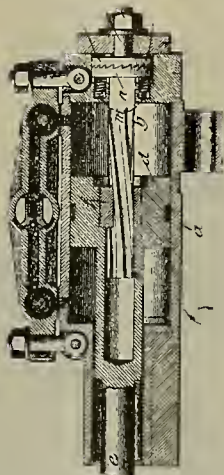
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MACHINE FOR CRUSHING ORES OR OTHER USES.—No. 782,264; D. J. Nevill, Salt Lake City, Utah.



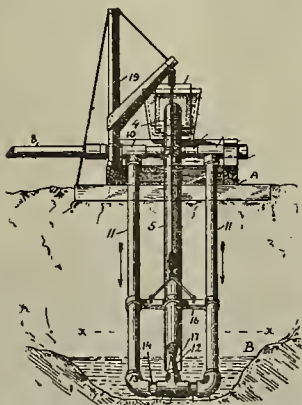
In machine for crushing ores, etc., combination with pair of rolls and movable bearing at each end of one of rolls, of spring for each of bearings, two pressure plates which are independently movable and between which spring is supported, and means for transmitting movement of bearings in opposite direction to other plate, and adjustable rigid abutment for plates farthest from bearing.

ROCK DRILL.—No. 782,429, R. Temple, Denver, Colo.



In rock drill, combination of cylinder portion, reciprocating piston movably mounted therein, rifled nut in engagement with piston head, rifled bar in engagement with nut and provided with radially arranged face ratchet at its outer end, second radially arranged face ratchet frictionally held in cylinder head, stem portion therefor extending through cylinder head and provided with threaded end portion, threaded nut on threaded end of stem portion, yielding washer inserted between second ratchet and cylinder head to hold same in frictional engagement with cylinder head, and spring mechanism engaging first named ratchet, so as to normally hold it and thereby rifled bar in engagement with second ratchet.

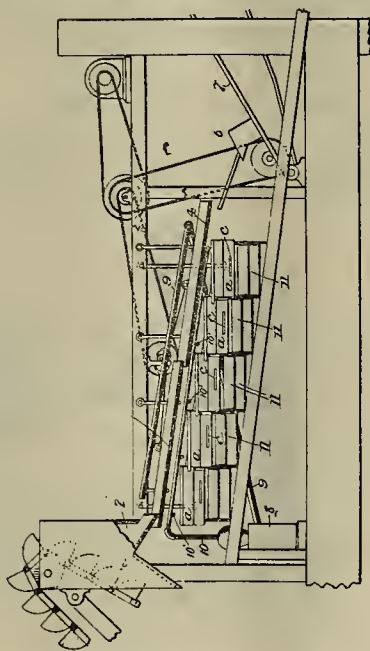
HYDRAULIC LIFT.—No. 783,177; G. F. Cluff, Lodi, Cal.



In hydraulic lift, combination with movable uprise pipe, of slotted receptacle into which uprise pipe discharges, size of pipe being less than size of slot, means carried by uprise pipe for automatically closing unoccupied portion of slot, supply pipe lead-

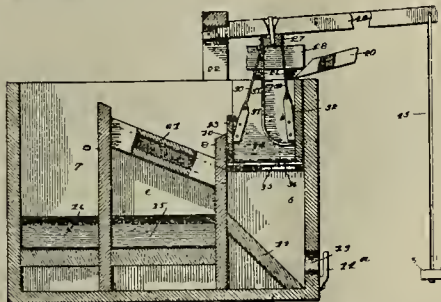
ing to lower end of uprise pipe and nozzle for directing fluid from supply pipe into uprise pipe.

CONCENTRATING APPARATUS.—No. 783,221; O. B. Perry, San Francisco, Cal.



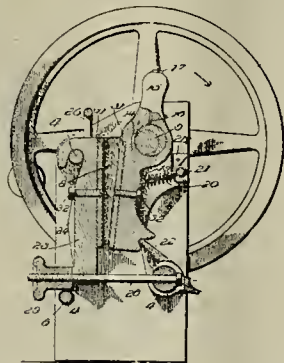
In concentrating apparatus, combination of screen, series of collecting tables located below and arranged successively lengthwise screen, distributor comprising series of independent pan sections successively arranged and located between screen and tables, and plurality of independent troughs extending from receiving end of screen lengthwise along series of pans and tables, all of troughs leading from common receiving point and delivering separated portions of material to separate pans at different distances from point.

ORE CONCENTRATOR.—No. 783,304; M. E. Parks, Torreon, Mexico.



Ore concentrator, comprising outer structure transverse forward and rearward vertical partitions dividing interior thereof into concentrator box, tailings box, and slimes box, and vertically reciprocatory jigger in concentrator box, combined with means for operating same, rearward partition being less in height than walls of structure, and forward partition less in height than rearward partition, inner side of jigger being also less in height than outer side.

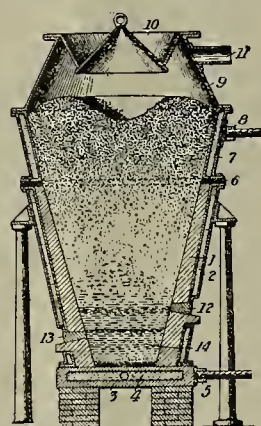
ORE CRUSHER.—No. 783,323; F. P. Snow, Los Angeles, Cal.



In rock crusher having suitable hopper or receptacle for rock, vertically removable stationary jaw, adjustably secured at lower end within frame; vibrative jaw mounted at upper end upon eccentric driving shaft; independent vibrative toggle pivoted in plane below free end of vibrative jaw and having outer end located within lower end of jaw; and spring connected with vibrative jaw and with frame; whereby circular or gyratory movement is imparted to upper end of vibrative jaw and lower end of same

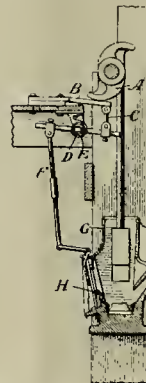
caused to describe arc of small amplitude, imparting oscillatory and vibrative movement to lower end.

PROCESS OF SMELTING REFRACTORY ORES.—No. 782,922; E. F. Price, Niagara Falls, N. Y.



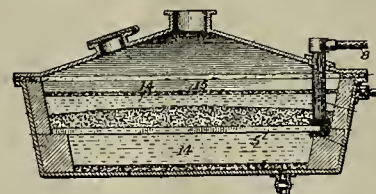
Process of producing calcium carbide by interposing charge of calcium compound and carbon as resistance conductor between electrodes, one of electrodes being of metal and comprising liquid portion and solid portion, electrically heating charge to temperature requisite for reduction, and cooling solid portion of metal electrode.

ATTACHMENT FOR KEEPING SCREENS IN GOLD QUARTZ MILLS CLEAN.—No. 782,861; C. G. Lidman, Lead, S. D.



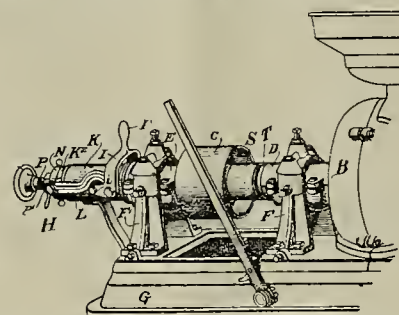
Combination with mortar screen, of bail having side arms hinged to mortar frame and connected to moving part of stamp to effect impact between cross bar of bail and screen, which by means of combination set forth.

ELECTROLYTIC PROCESS OF REDUCING METALLIC SULPHIDES.—No. 782,894; C. E. Baker and A. W. Burwell, Cleveland, Ohio.



Process of reducing metallic sulphides, supporting sulphide within electrolyte of molten chloride and in proximity to anode, passing electric current from anode through electrolyte, and causing electrolytic chlorine to react on sulphide and displace sulphur.

QUICK RELEASE DEVICE FOR ATTRITION OR OTHER MILLS.—No. 782,933; J. Waldron, Muncy, Pa.



Quick release device for grinding mills comprising, in combination with fixture and movable bearing for shaft of one of grinding disks, dead point elbow lever having shorter arm pivoted to fixture, and bowed link curved over pivot of lever and pivotally connecting elbow of lever with movable bearing.



## Bending Stresses in Wire Ropes.\*

Written by SAMUEL DRESCHER.

This paper relates to bending stresses as they occur in the wires of ropes bent around sheaves in the operation of hoisting machinery, inclined planes, cable railways and elevators, etc. It is herein assumed that the sheaves employed in such work are of diameters commensurate with the diameters of the ropes wound around them. According to a rule long since adopted in practice, sheave diameters shall equal, or exceed, forty-eight diameters of the corresponding ropes—that is to say, that for every quarter inch of the diameter of the rope, 12 inches are to be allowed for the diameter of the sheave. That this ratio is adequate is proved by the fact that when during the service of a rope in connection with a sheave of such diameter a wire breaks, it does not immediately part, but the broken ends remain in touch for several days and so close to one another that the break is detected only upon very careful inspection when the rope is at rest. From this we are justified to infer that the grip the wires have on each other, by reason of the twist, is such that those ends are held close together even while the rope passes around the sheave. On the other hand, it is obvious that if the ratio between sheave and rope diameters were only 24 to 1, the fractured ends of that particular wire would part sooner, owing to more severe bending, than with large sheaves. What the smallest diameter is that will yet answer can be ascertained by experiment only. Moreover, as the ratio of 48 to 1 is in most cases permissible, with reference to local conditions, we take it for granted that the ropes and sheaves considered in our investigations are of right proportions.

It is not the intention herein to undertake to ascertain the effect of bends that cause permanent stretches, as, for instance, loops and kinks, but these investigations are limited to the consideration of working conditions as usual in practice. Abrupt bends cause lateral spreading of the strands and consequent flattening of the section of that rope. A rope repeatedly subjected to such treatment would rapidly disintegrate.

I am not aware that ever any extensive practical tests were made toward establishing the effect that bending has upon the stress among the strands and wires of a rope. The experiments made in this direction were not pursued far enough to yield definite and reliable data.

It is in the interest not only of the users but also of the makers of wire rope that tests be made in this line, under conditions like those in practice. The parties most competent to do this are the manufacturers of wire rope.

In Kent's "Pocket Book for Mechanical Engineers" is given a formula for the calculation of bending stresses in wire ropes. It has also tables containing the results of calculations for various sizes of ropes and sheaves; but in that formula no cognizance is taken of the load hanging on such a rope, whereas, in fact, it takes more effort to bend a rope if taut than if slack.

It seems that this formula was made under the impression that in bending a rope the conditions are about the same as if bending a solid bar; for, according to these tables, the stress produced in the wires of a rope 2 inches in diameter, bent around a sheave 8 feet in diameter, is 57,000 pounds. If this were correct, the breaking of ropes on inclined planes, elevators, etc., would be of daily occurrence, and necessarily the use of wire ropes for such purposes would have to be abandoned. The fact is that the conditions prevailing in a wire rope while it is being bent differ very much from those in a bar subjected to the same operation. If we take a bunch of straight wires, arranged as in Fig. 1, tie them near one end by a tight-fitting ring into a cylindrical group, so that the wires can not shift relatively, and then bend that bunch, as shown in Fig. 2, the loose ends of the individual wires will not flush any more, as they were before bending, but, instead, the wires on the concave side of the curve are projecting, while those on the convex side are retreating, and all wires between concave and convex side follow more or less according to their situation in the bunch with relation to the neutral axis.

The resistance experienced in bending that bunch of wires is equal to the sum of the resistance of the individual wires, for each wire acts as a spring, and if the bunch consists of 100 wires its total resistance equals that of 100 springs each of the strength of a single wire. Now, let us take another bunch of wires of same number and size, but to have both ends firmly bound, as in Fig. 3. If we try to bend this bunch, we encounter many times the resistance we found in the bunch having one end open. This difference arises from the circumstances that in the bunch with fixed ends the wires can not accommodate themselves to the difference in length between inner and outer curve, but must necessarily stretch and contract, or buckle on the concave side, as in Fig. 3; but to do any of these acts requires much more effort than in the case of Fig. 1, where the wires could adjust themselves to altered conditions. Now, let us see what happens if we bend a rope of, say, 2 inches diameter,

around a sheave. Fig. 4 shows a fragment of wire rope that consists of six strands wound around a hemp core. As those strands are laid around the center in screw-thread fashion, all are subjected to precisely the same distorting and straining effects; consequently, whatever happens to one of these strands happens to all; therefore, we shall confine ourselves to the consideration of one strand instead of six of them.

Fig. 4 shows how a single strand lies around the hemp core. Its length is that of one turn around the core. The length of such a turn usually equals six diameters of the rope. Thus in a rope of 2 inches diameter the difference between corresponding points in one and the same strand is 12 inches.

By the act of bending, the point C of the strand is pressed against the rim of the sheave, the arc DCE flattens and the space DE spreads. If, at this occa-

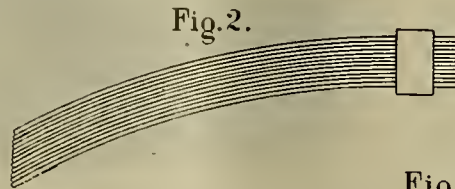


Fig. 3.

sion, the points D and E were firmly held, the flattening of that arc could not occur, except to the extent that the compressibility of the material in the strand would permit. But since the points D and E are not fixed, and that the arcs AD and EB are in tension, and, further, that through the bending of the rope the chords AD and EB must expand so much as the chords DC and EB must contract; therefore, compression can not manifest itself, because any pressure at C must necessarily forward the local surplus towards points A and B. Hence the tension that occurs under ordinary conditions in the fibers of the convex side of a bent bar is, in the case of a rope, neutralized in the manner that the increment which the upper fibers lack is drawn from the concave side of the rope, whence an equal increment is displaced, by reason of the shortening of the arc DCE, contingent to the act of bending.

Compression in that arc DCE could take place only under the condition that the points D and E act as abutments; but, since these points readily yield, therefore, the surplus in arc DCE is at once transferred beyond the points D and E, to where it is required to prevent tension.

In this manner the bending of the rope takes place without severe stress in any part of the strand, because the increase in the outer circumference over that of the neutral axis of the rope is supplied by the corresponding decrease of the inner circumference. This compensation occurs locally, within every turn of the strand. The tendency to pull in the upper part is equal to that to shove in the lower part, and as both these forces lie in one and the same line and act in the same direction, therefore, neither opposes the other, but, on the contrary, they act in accord, with a common result. Hence, as far as these two forces are concerned, the movements within the strands would meet with no resistance at all, but owing to the fact that all strands are in close contact with each other and the rope is in tension due to the work it performs, therefore, there is a certain amount of friction to overcome when the strands adjust themselves to altered conditions.

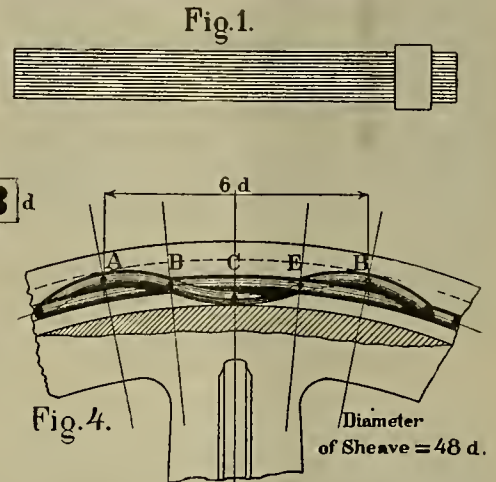
Considering a 2-inch rope, and a sheave of 8 feet diameter, the difference between inner and outer circumference of the coil of rope, as laid on the sheave is  $4 \times 3.14 = 12.56$  inches = 1.04 ft, say, 1 foot. But the rope as laid around the sheave, measured along its neutral axis, is already  $2 \text{ inches} \times 3.14 = 6.28$  inches = 0.52 foot, longer than the circumference of the sheave, therefore, the elongation that occurs on the convex side of the rope during one revolution, is  $\frac{1}{2}$  foot, and in accord with this, the contraction on the concave side of the rope is also  $\frac{1}{2}$  foot, and likewise is also the whole adjustment during one revolution of the sheaves,  $\frac{1}{2}$  foot of all of which compensation takes place in the manner that the excess of the concave side is shifted to the convex side, and this takes place while the rope changes from a straight line to a circle. This motion is the aggregate of all motions in one strand that occur during a full revolution, and must take place under the pressure the rope exerts against the rim of the sheave which in turn reacts upon the rope and its strands. The resistance that opposes this motion is friction among the strands as they rub against each other.

The intensity of this friction depends upon the

pressure applied and the coefficient of the materials in contact. The coefficient of a steel rope upon a cast iron finished surface is 0.13. To be entirely safe, let us assume it to be 0.15.

The pressure that a rope exerts upon the circumference of a cylinder, if no matter what diameter, is  $2 \times 3.14 \times P$  per full coil. In this formula P represents tension in the rope due to its load. In the present instance let us take that tension at 30,000 pounds. Hence the aggregate pressure that one coil exerts upon the circumference of a cylinder, or sheave, is:  $2 \times 3.14 \times 30,000 = 188,400$  pounds. The circumference of an 8-foot diameter sheave is 25.13 feet. Hence the pressure upon 1 foot of circumference of this sheave is 7216 pounds, or say, 7200 pounds.

In a rope of 2 inches diameter a strand makes one winding around the core in 12 inches; therefore the compensation between compressed and pulled parts



of that strand must also take place within the length of 12 inches, and as this compensation is continuously occurring and that there are always exactly 12 inches of that rope affected, it is evident that the resistance opposing that readjustment is the friction produced by the pressure upon 12 inches of that circumference of the sheave, but since this pressure is 7200 pounds, the friction thus produced is  $7200 \times 0.15 = 1080$  pounds. As there are six strands in the rope and at all times engaged in the act of adjustment, we must multiply the resistance by six and thus get  $6 \times 1080 = 6480$  pounds as the total bending stress in the rope.

The power consumed in doing this bending is the bending stress multiplied by the amount of motion in the strands during the process of adjustment in one revolution. We saw before that the whole movement of the strands within one coil of the rope on the sheave is 0.5 foot, consequently the work of bending is  $0.5 \times 6480 = 3240$  foot pounds.

Applying this to a practical case, say, an incline plane of 1000 feet in length, or a shaft of this depth, the same sheave will make  $1000 \div 25 = 40$  revolutions, and as it takes 3240 foot pounds per revolution, the power consumed during one run in performing the work of bending the rope is  $40 \times 3240 = 129,600$  foot pounds. If this run is made in one minute, the power spent is  $129,600 \div 33,000 = 3.93$ , say, 4 H. P.; if made in two minutes it takes 2 H. P., etc.

If, for example, we were to use a sheave of only 4 feet diameter, the total pressure the rope would exert upon the rim of the sheave is the same as if the diameters were ever so large; but as the circumference of the sheave is only half as much as that of 8 feet diameter, therefore, the pressure per lineal foot of the rope is twice as great, and, consequently, the friction opposing the adjustment of the strands is double that in the other instance. This alone is sufficient reason to provide large diameter sheaves, but in addition to the double friction, we must take into consideration also that the 4-foot diameter sheave by reason of having but half the circumference of the 8-foot sheave must take twice as many revolutions for a given length of hoist as the latter, and since the amount of adjustment per revolution is the same with sheaves of all diameters, therefore, the energy consumed in using a 4-foot sheave is four times that required with an 8-foot sheave. In short, the resistance opposing the adjustment of the strand grows inversely with the diameter of the sheave and the energy required to accomplish that adjustment grows inversely with the square of the diameter of the sheave. Both instances refer to the same velocity of the rope.

In connection with the bending act it is to be said that the straightening of the rope does not require any external force, because in the act of bending the elastic resistance of the strands must be overcome, whereby energy is stored in those strands in same manner as by compressing or stretching a spring which resumes its original state upon being released. Therefore, the energy required to straighten the rope is imparted to the rope while it is being bent.

It stands to reason that there is a limit to the compensating capacity of the strand in a rope, but where that limit lies can be determined only by actual trials under working conditions. This task by right

\*Trans. Eng. Soc. of W. Pa.



falls upon the manufacturers of wire rope, in whose interest it is to furnish the customers reliable information concerning the proper use of wire rope.

Following is a comment on the above article by Wm. Hewitt, C. E., in the Engineering News, and as most of the data in Mr. Drescher's article were compiled from tables prepared by Mr. Hewitt some years since, is of interest:

The formulae given in Kent's "Pocket Book" for determining the bending stress in wire rope corresponds very closely with the formulae given by other authorities, and differs from the others in the fact that it makes allowance for the double spiral lay of the wires, and the conditions of bending are not considered the same as that of a solid bar. This formula simply gives the bending stress, to which the load stress is added in determining the total stress.

Taking the case of a 2-inch rope on an 8-foot sheave, the bending stress of which is given in the table calculated from the formula referred to as 57,000 pounds, I cannot see why Mr. Drescher should draw the conclusion that he does, because the maximum stress that such a rope made of steel wires would safely sustain is very much greater than 57,000 pounds. The conclusion arrived at in Mr. Drescher's investigation, that there is a compensating action in the wires whereby the bending of a wire rope takes place without severe stress in any part of the strand, owing to the tendency to pull in the upper part being equal to that to shove in the lower part, is not borne out by practical results.

After many years' experience with wire rope, I am convinced that the formula given in Mr. Kent's book is correct and reliable.

## Gold Mining in Rhodesia.

NUMBER V.

Written for the MINING AND SCIENTIFIC PRESS by F. C. ROBERTS.

Continuing the consideration of the expense of milling, the several items constituting this expense are as follows:

MILLING.			
	Total Cost.	Cost Per Ton.	Total Cost, %
Salaries.....	\$ 2,316 01	\$ .0000	4.87
White wages.....	4,880 75	.1268	10.26
Native wages.....	1,707 96	.0440	3.59
Native food.....	623 38	.0162	1.31
Stores.....	4,501 68	.1170	0.46
Explosives.....	3 99	.0001	.01
Fuel.....	5,661 34	.1472	11.89
Maintenance.....	4,174 89	.1088	8.79
Workshops.....	374 53	.0086	.77
Mill engine and boilers.....	8,642 46	.2228	18.61
Pumping station.....	2,119 96	.0560	4.53
Electric lighting.....	555 45	.0136	1.1
Transport.....	20 10	.0006	.07
Native hospital.....	54 78	.0014	.11
Native labor supply account.....	31 52	.0008	.07
Pumping (mine water).....	1,675 73	.0436	3.52
Compound.....	532 96	.0144	1.12
Sorting and crushing.....	8,625 31	.2212	18.13
Assaying.....	1,047 36	.0372	2.2
Totals.....	\$47,589 16	\$1.25+	

### MILL ENGINE AND BOILERS.

	Total Cost.	Cost Per Ton.	Total Cost, %
White wages.....	\$ 3,567 38	\$ .0028	20.03
Native wages.....	3,020 24	.0786	16.95
Native food.....	1,321 47	.0344	7.42
Stores.....	2,968 00	.0772	16.05
Fuel.....	5,634 85	.1460	31.65
Maintenance.....	544 45	.0142	3.06
Workshops.....	392 85	.0102	2.20
Electric lighting.....	221 92	.0058	1.23
Compound.....	130 21	.0034	.72
Totals.....	\$17,801 34	\$ .462	

### HAULING ENGINE AND BOILERS.

	Total Cost.	Cost Per Ton.	Total Cost, %
White wages.....	\$ 2,121 82	\$ .0552	45.
Native wages.....	548 40	.0144	11.64
Native food.....	236 97	.0062	4.04
Stores.....	653 14	.0170	13.80
Fuel.....	360 11	.0092	7.72
Maintenance.....	309 54	.0080	6.46
Workshops.....	352 83	.0092	7.52
Electric lighting.....	80 02	.0020	1.75
Compound.....	44 29	.0012	.93
Totals.....	\$ 4,607 12	\$ .125	



A Modern Equipment on an Ancient Mine in Rhodesia.

CYANIDING. — Generally speaking the ores thus far produced in Rhodesia present few metallurgical difficulties.

In most cases the veins produce typically free milling ores. In fact, upon the properties with which the writer is connected, the highest grade of tailings produced is valued at \$3 per ton—this from an original product of \$16 to \$18 per ton.

If the mill were operated with a view to high plate extraction and the tonnage sacrificed the grade of tailings would be even less. The sand, if fresh, lends itself freely to cyanide treatment at a comparatively low cost per ton, while if highly oxidized, through a decomposition of the salts, as is often the case when working in close proximity to the "old workings," a small additional cost is incurred in neutralizing.

The consumption of stores upon a cyanide plant of 2800 tons per month capacity, measured over a period of twelve months, is given below:

CYANIDE STORES.			
Stores.	Quantity.	Total Cost.	Cost Per Ton.
Borax.....	457 lbs	\$ 134 47	\$ .0048
Carb. soda.....	120 lbs	9 24	.0004
Grease.....	131 lbs	16 78	.0006
Nit. acid.....	5 qts	38 41	.0008
Sil. nitrate.....	2 lbs 4 oz	30 67	.0010
Cyanide.....	21,056 lbs	6,570 25	.2294
Lime.....	452 bgs	1,760 25	.0614
Sulph. acid.....	63 jars	589 22	.0204
Zinc.....	7,283 lbs	1,119 33	.0392
Sundries.....		579 42	.0202
Totals.....		\$10,851 82	\$ .3782

In the construction of the double-treatment cyanide plants erected in this country, no new features are embodied over those included in this style of plant of five years ago. The time of treatment varies with different ores, depending largely upon the character of the gold being dealt with. In some instances which have come under the notice of the writer, where the gold appeared to be coated with a very thin film of iron sulphide, as much as twelve days have been consumed in dissolving, but the usual treatment extends over a period of from three to four days.

A great variation is shown in the fineness of the gold produced from cyanide slime. Often, due to the preliminary method of treatment, gold as low as 250 fine and as high as 900 fine is produced.

It is quite possible and inexpensive to produce gold as fine as 930 to 940 from cyanide slime by using Burnett's flux, which is here given:

### AFTER ACID TREATMENT.

	Parts.
Slime.....	100
Fused borax.....	20 to 35
Manganese dioxide.....	20 to 40
Sand.....	15 to 40

The addition of a cyanide annex in a country of free-milling ores may be questioned, and, no doubt, rightly so in some cases; but it is contended that if the grade of tailing will in the first place pay for treatment it is an advantage, in that it is possible to largely increase the capacity of a given number of stamps, with a corresponding decrease in the costs per ton.

The results of operating a cyanide plant of 2800 tons capacity per month, extending over a period of twelve months, is here given:

CYANIDING.			
	Total Cost.	Cost Per Ton.	Total Cost, %
Salaries.....	\$ 3,294 62	\$ .1152	9.52
White wages.....	4,659 10	.1630	13.51
Native wages.....	4,009 54	.1400	11.58
Native food.....	1,674 80	.0586	4.86
Stores.....	10,828 80	.3302	31.81
Maintenance.....	1,361 40	.0476	3.94
Fuel.....	1,116 26	.0390	3.24
Workshops.....	423 98	.0146	1.22
Mill engine, etc.....	948 63	.0332	2.33
Pumping station.....	1,390 95	.0468	3.88
Electric lighting.....	385 44	.0134	1.12
Transport.....	31 47	.0010	.08
Native hospital.....	124 23	.0044	.35
Native labor supply.....	80 82	.0028	.22
Pumping (mine).....	1,706 85	.0618	5.10
Compound.....	679 12	.0238	1.96
Assay account.....	1,850 87	.0618	5.35
Totals.....	\$34,045 68	\$2.210	

Tons treated..... 25,345  
Cost per ton milled, cents..... .909

### SUMMARY.

	Total Cost.	Cost Per Ton.	Total Cost, %
Mining.....	\$128,787 68	\$3.380	45.54
Transport of ore.....	3,857 18	.101	1.36
Milling.....	47,589 18	1.250	16.83
General charges.....	22,037 60	.579	7.8
Cyaniding.....	34,586 34	.909	12.34
Gold realization.....	4,013 80	.105	1.42
Bulawayo office.....	9,367 60	.245	3.32
Redemption.....	32,451 93	.846	11.48
Totals.....	\$232,691 31	\$7.415	

### GOLD REALIZATION.

	Total Cost.	Cost Per Ton.	Total Cost, %
Salaries.....	\$ 334 15	\$ .0088	8.44
White wages.....	34 05	.0008	.845
Native wages.....	5 05	.0001	.12
Native food.....	1 97	.0000	.06
Stores.....	719 87	.0188	17.85



Ancient Ruins, Zimbabwe, Rhodesia.



Walls of Ruins at Khamo, Rhodesia.



Charcoal account.....	30 24	0008	72
Fuel.....	51 10	0014	1.35
Insurance, reining, escort, etc.	2,765 25	0735	69.43
Maintenance.....	8 07	0002	24
Electric lighting.....	2 58	0000	08
Compound.....	78	0000	02
Assay account.....	30 60	0008	72
Totals.....	\$4,013 80	\$ 105	

ASSAY ACCOUNT.			
	Total Cost.	Cost Per Ton.	Total Cost.
Salaries.....	\$1,892 30	\$ .0402	38.81
White wages.....	161 72	.0012	3.38
Native wages.....	315 35	.0082	0.47
Native food.....	194 64	.0052	3.98
Stores.....	1,778 70	.0402	36.52
Charcoal.....	482 54	.0126	9.85
Maintenance.....	29 10	.0008	.60
Electric lighting.....	7 03	.0002	.19
Compound.....	7 05	.0002	.20
Totals.....	\$4,872 73	.1178	

An analysis of the stores consumed upon a mine containing a mill and cyanide annex, over a period of nine months, is given below. The tons milled during the period were 28,751.9 and tons mined 31,202.9:

Stores.	Quantity.	Total Cost.	Cost Per Ton, Cts.
Dynamite.....	46 boxes	\$ 337 32	2192
Gelatine.....	200 boxes	5,833 85	2008
Fuel.....	4,011 cords	28,323 08	9820
Candles.....	858 boxes	3,994 25	1375
Fuso.....	13,553 coils	1,634 35	0560
Detonators.....	505 boxes	538 25	0185
Rails.....	71 rails	371 00	0163
Trucks.....	2 trucks	718 88	0253
Steel.....	6,010 lbs. "Star"	3,370 11	1160
Steel.....	12,594 lbs. "Oct."		
Spikes, etc.....	539 lbs.	210 10	0072
Wire rope.....	350 feet	172 71	0052
Charcoal.....	4,192 bags	3,557 95	1224
Nuts, bolts, nails.....		382 81	0131
Pipes and fittings.....		3,880 84	1325
Deals.....	1,018 feet		
Pitch pine.....	235 feet	1,401 17	0482
Mine timber.....	2,509 poles	858 20	0295
Chemicals (assay).....		283 84	0097
Mercury.....	59 lbs.	46 40	0015
Waste.....		304 70	0070
Nuts and lubricants.....		3,403 02	1171
Shoes.....	57 shoes	1,612 11	0554
Dies.....	58 dies	784 41	0271
Cam shafts.....	1 cam shaft	92 21	0031
Stems.....	1 stem	45 06	0015
Cams.....	1 cam	30 75	0010
Screening.....	378 feet	155 60	0053
Cyanide.....	73 cases	5,303 87	1794
Zinc.....	6,401 lbs.	596 02	0209
Lime.....	286 bags	1,147 82	0374
Office stores.....		609 96	0210
Sundry other stores—			
Mill.....	\$1,481 60		
Mine.....	599 19	3,246 70	1117
Cyanide plant.....	1,166 06		
Totals.....		\$73,752 70	2 2900

(TO BE CONTINUED.)

## The Mammoth Diamond.\*

Since the announcement of the discovery at the Premier mine, near Pretoria, of the "largest diamond" recently, I have received many applications from various sources for information concerning it.

The telegram giving advice of the finding of the stone conveys no particulars beyond stating the weight and that the quality of the stone is "good." The weight is quoted as being 3032 carats, which is equivalent to 20.013 ounces, or 1 pound 8 ounces, troy. For the purpose of weighing diamonds, one ounce troy consists of 151½ carats, and not 120 carats as in weighing gold.

It is impossible to give any opinion of the value of the diamond without actually handling it and making a careful examination of it. The value depends—

1. On the color and purity of the material.
2. On the freedom from imperfections.
3. On the shape.

The word "good" used in the telegram to describe the quality of the newly found diamond certainly does not convey that the stone is faultless, or very fine, but rather that it is just "good." Perhaps, however, this may be due to a natural modesty on the part of the company, and that it will possibly turn out to be of superb quality in every respect.

If the stone be free from imperfections, and an advantageous shape for cutting into a gem, it must lose half, or perhaps two-thirds, of its present weight during the process. It should then weigh 1516 carats to 1010 carats.

If, on the other hand, it has imperfections, such as internal spots, marks or flaws, it most probably will have to be divided into several or more separate stones in order to remove the faulty material.

With regard to the color, this can only be judged by the keen eye of the expert, who will compare it with other diamonds of importance, noting its resemblance to or difference from gems of standard quality.

The immense size of this diamond would certainly impress one that, if made into one gem, weighing, as already stated, 1516 carats, which is equal to 10.033 ounces troy, it not only will be with difficulty marketable, but essentially unsuitable for use as a jewel, for the size of the finished gem would be about the size of a teacup.

In addition, it must of necessity be mounted somewhat substantially for the purpose of jewelry, which would increase the weight and size of the "jewel" to still greater enormous proportions.

It will be interesting to watch the career of this great stone. Will it entirely lose its identity by

being formed into many gems, or will it ever appear upon the market as one huge brilliant of enormous price?

Until the discovery of the large stone at the Premier mine, the largest known diamond was the Excelsior, found at Jagersfontein in 1893. It weighed in the rough state 970 carats. It has been cut into no less than nine brilliants.

For the sake of further comparison, the following is a list of the greatest diamonds known, together with the weights. It must be borne in mind that these stones were cut at a very early period from the rough, so that the weights quoted are those of the stones after cutting. The original weights can only be a matter of conjecture, as the work of cutting was performed at such a remote date:

Names of Stone.	Present Weight.	Probable Original Weight.
Kohinoor.....	186 carats (reduced to 106 carats)	393 carats
Pitt (or Regent).....	137½ carats	410 carats
Great Mogul.....	279 carats	560 carats
Orloff.....	193 carats	400 carats

As far back as it is possible to obtain any records, diamonds were cut and polished in a crude way in India, and to this day may be seen in the regalias of native princes, etc., gems of untold value, the beauty of which is entirely marred by want of scientific cutting.

The earliest reference to be found of diamond cutting in modern Europe is in 1456. At this time, when Bruges was not only one of the principal ports of Europe, but an artistic center of all kinds of arts and crafts, there lived in this town a Frenchman named Louis De Burquheim, to whom is attributed the credit of first cutting diamonds with a regular arrangement of facets. De Burquheim discovered that by a certain relationship of the facets on a diamond the reflection and refraction of light were greatly increased, and, with the exception of various slight modifications, his method of polishing diamonds is adhered to to this day. Many very fine gems undoubtedly passed through De Burquheim's hands, and his name became famous in connection with his work. The industry of diamond cutting, therefore, became established and flourished at Bruges for many years, for we find a guild of diamond cutters there in 1470; but after the death of De Burquheim it eventually got dispersed to other cities, to which his pupils separated. Amsterdam, Antwerp and Paris all had their diamond cutting establishments, those of Paris being, however, the most important.

The French retained a great share of the trade, which was patronized by the wealthy and extravagant classes, and in which it is said Cardinal Mazarin took a great interest, until the troubled times of the eighteenth century. In Holland and Belgium, however, the industry of diamond cutting took so firm a root that to this day it is the principal business of Antwerp and Amsterdam.

Many fine gems are, however, cut in London, and since the placing of rough stones on the free list by the Dingley law a share of the business has been attracted to the United States, although the craftsmen employed are nearly all foreigners.

The method of cutting diamonds differs in many respects from that used in connection with all other precious stones, and, in fact, diamond polishing constitutes a distinct craft which forms the basis of an entire industry, irrespective of other precious stones. The process consists of three distinct operations—"bruting," "polishing" and "cleaving."

The "bruting" of diamonds consists of rubbing two diamonds together in such a way that by continual friction each can be made to assume the desired shape. Each diamond is cemented upon one end of a stick or holder about 1 foot long, and the operator firmly holds one of these sticks in either hand. The stones are then rubbed and pressed one against another over a wooden trough containing a very fine metal sieve, into which fall the particles of diamond dust rubbed from the stones. In order to obtain sufficient leverage, the holders upon which the diamonds are secured are held against little metal projections in either side of the trough.

The dust which falls through the metal sieve is carefully preserved and used in other parts of the process for polishing purposes. The dust is known as "diamond powder," and it has exactly the same appearance as slate pencil dust. Upon the principle of "diamond cut diamond," the stones are fashioned into the required shape, and it is the duty of the bruter to roughly fashion the stones into whatever symmetrical form he has designed them to be when finished. The small polished flats, known as facets, with which the surface of a diamond is covered are added subsequently to this, and form another part of the process.

When the bruter has completed his part of the work, the diamonds are handed to an attendant, who is seated at a bench in front of two flaring argand burners. Small brass basins, known as "dops," which vary in size from 1 to 3 inches in diameter, are placed in the flames, and each dop is filled with a mixture of tin and lead in the proportion of one part of tin to two of lead. When this metal has assumed a semi-molten state, it is fashioned into the shape of a cone by means of a large pair of soft iron tongs, and upon the apex of each cone one of the bruted diamonds is carefully embedded.

After the diamond has been carefully adjusted, the

dop containing the cone of hot metal surmounted by the diamond is plunged into cold water. The stone is then firmly fixed, the dop forming a kind of holder for it.

The stone is now ready to be handed to the polisher, but it is necessary for it to be returned from time to time to be unsoldered and readjusted, in order that a different part of the stone may be brought into prominence, as it is only possible to work upon that part of the stone which projects from the metal. This operation is repeated continually until the process of polishing is completed. The operation of embedding diamonds in the metal as I have described is known as "soldering."

The polishing of diamonds is an arduous and at the same time a delicate process. The craftsmen are seated, generally with their backs to the light, in front of revolving wheels, which are made of very porous cast iron. The wheels turn in a horizontal position at about 2500 revolutions a minute. The technical name for a diamond polishing wheel is "skeif." The dops containing the diamonds are held by means of iron clamps against the surface of the skeif, and kept in position by means of heavy weights. Four of these clamps are manipulated by each operator at the same time, and he is able to examine, first one diamond and then another, occasionally plunging each into cold water to prevent the heat generated by the friction from unsoldering the stone, which would occasion considerable damage to the gem and loss of valuable time and labor.

The surface of the skeif derives its erosive property from the continual application of diamond dust mixed with olive oil, and to the dust which comes off the stones undergoing the process. The facets are polished on to the diamonds by means of pressure against this erosive surface while it revolves at a high speed.

The diamond dust is prepared by means of steel pestles and mortars, into which fragments of bort, or coarse, valueless diamonds, are placed. By means of blows and great pressure upon the pestles the desired fineness of diamond dust is obtained.

As the diamond dops are frequently too hot to hand from one man to another with comfort, even after having been plunged into cold water as already described, wooden holders are used for the purpose of handling them more readily.

The "brilliant" is the usual form into which diamonds of any importance are cut. The front of a "brilliant" consists of an octagonal facet in the center, termed the "table," which is surrounded by thirty-two smaller facets extending from the table to what is known as the "girdle," or edge of the stone. The back of the "brilliant" is in the shape of a pyramid. The small facet at the extreme apex is known as the "collet," and there are twenty-four facets, reaching from the "collet" to the "girdle." The brilliancy of a brilliant cut diamond is due to the refraction and reflection of light from facet to facet within the gem, and a well-cut "brilliant" should be so proportioned that a ray of light entering the stone from the front is refracted about within the stone and out again from the front, thus causing the maximum of refraction.

The "rose" is another form of cutting, which is, however, only used for small, thin stones which are unsuitable for making "brilliant." The front of it is covered with six or more triangular facets of equal size, and the back is quite flat. The effect obtainable from a "rose" cut diamond is very small compared with that of a "brilliant." As the rose is devoid of the pyramid which causes the luster of a brilliant cut stone, it necessarily refracts the light in a very small degree.

The "briquette" is a pear-shaped diamond, and is covered all over with triangular facets like the front of a rose. It has neither "table," "girdle" or "collet," and is generally drilled across the narrow end in order that it may be worn swinging as a pendant or some other similar device.

Besides the three principal forms of cutting, which I have already described, diamonds are sometimes cut into what is known as "single cut" stones—that is, brilliants without the full complements of facets. It is unnecessary, however, to say that diamonds cut in this way lack in brilliancy. Thin cleavage, or slice-like pieces of diamond, are sometimes polished with one very large facet on either side surrounded, perhaps, with a few very small ones at the edge. Diamonds cut in this way are used to put in front of tiny miniatures, in which way they are mounted into rings and other jewels.

I have now to describe the process of cleaving diamonds. When it is necessary to divide a rough diamond into halves, or to remove a small projecting part of a large stone, advantage is taken of the property of cleavage—that is, the natural tendency of a diamond to divide along certain planes parallel to the faces of the octahedron. With this object in view, the diamond to be cleaved is cemented upon the end of a wooden stick or holder in such a position that the plane of cleavage to be used in the operation lies parallel to the length of the stick. The stick is firmly fixed in the center of a weight projecting from the wooden bench in front of the operator. A steel blade is held against the diamond in the desired position, and by means of a smart blow upon the back of it the stone is caused to divide along the cleavage plane.

\* Leopold Claremont in the London Min. Journal.



## Mine Superintending.

Written for the MINING AND SCIENTIFIC PRESS by  
E. RAMMELMEYER.

Much has been written about mine managing and mine superintending. This is a widely diffused field and large mines are fortunate enough to enable them to employ mine manager, mine superintendent, foreman, shift boss, assayers, surveyors, time keepers, accountants and other high-grade help. Other mines, or a large number of them, are not so fortunate as to have all these men, and I will speak here only of the mine superintendent who has charge of a mine without a large staff or who has sometimes only to rely upon his knowledge of the different departments. I do not refer at all to the manager who directs the clerical staff, keeps in touch with the owners or directors of the property or company, or who compiles the daily, weekly or monthly financial reports.

I shall dwell here only upon the duties and responsibilities of the superintendent or man in charge who has to direct and execute the work in and about a mine. His duties are multiform and his experience must be of some years standing to enable him to get a thorough insight of his detail work and to give orders understandingly.

He must be many-sided, his mental and physical energy must be tried and tested and he must be controlled and regulated by a sound mind. The experience he has gained in former years in the different departments which he has now to oversee are the prime factors for a successful mine superintendent.

First of all he must know what a day's work consists of, and they are quite different as to mining, mucking, blacksmithing, timbering, engineering, etc., and again these may be varied in different localities under different conditions. Unfamiliarity with these facts, or some of them, in a good many cases is the cause of expensive mining ventures and is disastrous to the success of properties which should yield fair returns if properly worked.

The first care of a mine superintendent when entering upon his duties in a mine will be to see that his men are safe. On entering a mine either by shaft or tunnel the proper adjustment of timbers will first attract his attention. The same vigilance has to be exercised in stopes, raises and winzes. It is often the case that by the negligence of proper timbering ore bodies cannot be extracted and miners have frequently lost their lives.

We often notice in some mines after a change of superintendents either accidents increase or vice versa. It is not always the case that these fatalities are the result of the ignorance and carelessness of the workmen. Defective hoists, skips, cages, roadways, powder thaws too close to where the men are working, and similar other instances, not here mentioned, are often wholly overlooked by the superintendent. This with a knowledge of assaying and mine surveying constitute the main factors which have to be thoroughly understood by the superintendent. But these pertain only to what he has to know to have his mine in working order underground.

Then as to the extraction of the ore. He has to consider the cost of either hand or machine work and to estimate correctly the right number of men to extract a certain amount of ore with as little expense as possible under the prevailing conditions and to improve upon them daily either by not handling the ore or waste too many times or by other contrivances as he may deem expedient. Instances occurred and came under the observation of the writer when after an expensive compressor plant was installed hand drilling had to be resorted to, it being cheaper on account of the ordinary small sized vein, thus delivering the ore clean without any waste.

To see heaps of iron, steel, broken pieces of machinery, drills, boilers, tubes, pipe, etc., lying about a mine—"no more good"—all expensive when new and now all in the waste heap, speaks volumes to a new superintendent when taking charge of a mine, and if he can read the signs he can make improvements right and left by looking through the mine and over the machinery. He must keep his eye on these parts, even the waste heap has taught him that.

He may have a hoist, boilers, water pumps, a small machine shop, blacksmith shops with engineers, blacksmiths, etc. Can he give them orders intelligently when something is broken or out of order without understanding what orders to give? Some say that he is willing to pay for the knowledge of others in the different departments under him, and which he sometimes does very dearly. His experience in different mines with pumps, hoists and other machinery, together with the up-to-date articles which treat upon these themes in the splendid mining journals of the present day, should give him such insight that he should know the workings of these machines as well as the engineers.

He must also know the geology and formation of the casings of the vein and have a knowledge of the different faults as they occur. As these can be diag-

nized, they have to be thoroughly gone into and understood by a mine superintendent.

For the most experienced mine superintendent it is sometimes puzzling to be confronted with a low-grade ore, which has to be extracted where mining and machinery is expensive, where transportation to the railroad is connected with difficulties and where freight and treatment are higher than in other localities. In places like this, ore which should yield fair returns is rendered valueless by these obstacles. Other drawbacks, such as scarcity of timber, water or fuel, or of too much water in a mine, bad air and numerous others, which are characteristic of most mining camps, tax the ingenuity, ability and experience of a superintendent to its fullest extent.

These conditions do not refer to a mine superintendent where the ore is high grade, yielding a fair profit, where the conditions are nominally good; or to where the superintendent does not have to have a varied experience provided he has a good foreman. The owners or directors also may not care as long as the mine pays well; thus a good many of his shortcomings are hid and he is ignorant of the fact that by a systematic working of the mine the profits may be considerably increased.

So a superintendent has to know a good many things, but time and space is too limited to detail any part of the different departments. By working and serving an apprenticeship in these is the only way to get familiar with and understand them intelligently.

A young mining engineer from England with letters from the head office in London came to a mine superintendent in British Columbia with the expectation of becoming assistant superintendent. The superintendent sent him to the foreman, who directed him to go to work as a mucker, whereupon the young man remonstrated, not having done that work before. The superintendent told him he began as a mucker and had not mastered it yet. Thus it may seem that a mine superintendent has to be a jack of all trades and master of none, but I may say there are a good many superintendents who have worked in all branches of their respective departments and who can fill almost any of the places creditably. I yet look back twenty-five years and more when mine superintendents moved mills and machinery from Utah 500 miles into Montana on ox teams. At their destination there were no machine shops to run to, the cost of living and labor was expensive, they had nothing to rely upon except their ingenuity to grapple with obstacles they were confronted with in new, untried districts where were their prospective mines and they were ultimately crowned with success. Skilled miners and mechanics were at a premium and not as plentiful as to-day. There the superintendent had to explain everything in, out of and about the mine to his subordinates to make a success of the undertaking.

These men are found in almost every mining camp in the Western States and territories and are much in evidence to-day, having charge of mines throughout the mining world. They have brought the present mining industry to the high standard it enjoys to-day, recognized in the financial world as the greatest factor to any industry and second to none.

It does not matter whether a mine superintendent is a graduate of a school of mines or has worked up from the bottom of the ladder, but he must understand these essentials herein stated and be a judge of human nature. These are nowadays the requirements for a successful mine superintendent.

## The Center Star Mine, Rossland, B. C.

NUMBER III—CONCLUDED.

Written by L. H. COLE.

**LOCATION OF SQUARE SETS.**—Transit set up at station 5 (see diagram); vernier at 0°, B; sight taken at station 6 and the angle turned in a clock-like direction to station 19 is measured; elevation of transit below station 5 is measured; vertical circle set at 0° and button set on line of plumb bob at station 19; horizontal distance between stations 5 and 19 measured. Transit is then set up at station 19 and angle turned to station 20, with station 5 as back sight. Station 20 is placed in the cap of the square set, the same distance from the post as station 19. Bearing of line 19-20 is then the bearing of square sets.

Stopes not having square sets are surveyed in exactly the same way as the drifts, except that a longer contour rod is used. Where the walls are very irregular, sights are taken on different points by the transit, and angle turned is read and the distance measured. The transit telescope is never plunged.

For diamond drill holes a sub-station is located on the end of the drill rod in the same way as a station is. The transit is then set up over sub-station and sight taken to collar of hole, with the last station as back sight. The line from sub-station to collar is the bearing.

The survey of stopes for the vertical projection is, in the case of narrow stopes, taken up with the transit. Transit is set up in a position (located from the nearest station) so that the back can all be seen

and sights taken to points on the back and vertical angle read and distance measured.

Square set stopes are taken up with a 14-foot rod and steel tape, since back can always be reached from the last floor.

The bearings of all lines taken underground are worked out from the azimuth of the back sight; the co-ordinates of the stations only are worked out by the traverse tables. All other points are plotted from their bearing and distances.

The working maps on which all underground work is plotted are drawn to convenient scales.

Geological maps are kept of each level, also assay sheets on which are plotted all assays run. Tracings of all maps are made for blue printing.

**SAMPLING.**—When ore is loaded on cars it is sold to the smelters, so that all sampling of shipments is made at the smelter sampling mill.

Chip samples are taken from the face and all headings, after each blast, except where running through known country, when only occasional samples are taken.

**ASSAYING.**—The samples to be assayed consist principally of diamond drill cores, daily chip samples and smelter controls. A double check is kept by assaying a floor sample as well as the ordinary control for each shipment lot. This floor sample is obtained as follows: When the last cut is made on the sampling floor of the smelter sampling mill, half is sent to the smelter assay office and the other half, which is called the floor sample at the mine, is sent directly to the mine and is treated there exactly as the other half at the smelter office. The smelter sample is ground and passed through a 120 mesh and divided into three parts. One part is assayed by the smelter, another part is the control that goes to the mine, and the third is kept for umpire. What remains on the sieve in the form of scales is cupelled separately and the result added to the pulp assay as metallics. The mine control has had these metallics extracted from it, and in order to keep a check on these metallics the above-mentioned floor sample is taken.

The control samples are assayed for gold, silver and copper. The six fusions of one-half assay ton each are run for gold and the average taken. The flux used is a litharge flux as follows:

Litharge.....	70 grams
Soda bi-carbonate.....	15 grams

and enough niter or argol to give a 20-gram button. In order to determine the quantity of niter or argol to be added, it is necessary to run a preliminary assay. The smelter uses a niter and nails flux, but the mine finds that by using a different flux it can obtain closer results. The iodide method is used for control coppers, but for all others the cyanide method is employed.

A very complete water system is now in operation, which supplies both the Center Star and War Eagle mines with water for boilers and compressors, and also for fire protection. The water comes from Center Star gulch and is handled by two high duty Cameron pumps and a duplex pump. The water is raised 500 feet through a 3-inch pipe, 2000 feet long, and discharged into a 30,000-gallon tank near the War Eagle shaft house. One hundred feet below this there is another 30,000-gallon tank, and on the slope of the hill, above the Center Star shaft house, there is another tank of the same capacity. This is provided with a 1000-gallon per minute duplex fire pump, which is always ready for immediate use (using either steam or air), and will give a pressure of 130 pounds. At the level of the company's offices a natural pressure of 160 pounds at the hydrants is obtained. The system has twenty-eight hydrants placed at convenient points to protect all the buildings of both mines.

Every employe of the company is put through a fire drill and there is a regular fire department in connection with the mine, apart from the city brigade.

Two shifts only of eight hours each are worked. The morning shift goes on at 7 A. M. and works, with an hour's intermission, until 4 P. M. The second or afternoon shift starts at 4 P. M. and with an hour for supper at 6 P. M. works till 1 A. M. Two men during the hours from 1 to 7 A. M. blast all the ground drilled and ready for breaking and turn on the blowers, thus leaving the mine free from smoke and ready for the morning shift. The scale of wages is as follows:

Shaft men.....	\$1 00*
Machine men.....	3 50
Timber men.....	3 50
Muckers.....	2 50
Carpenters.....	3 50
Machinists.....	4 00
Blacksmiths.....	4 00
Blacksmiths' helpers.....	3 00
Hoisting engineers.....	4 00
Powder and tool boys.....	2 50
Surface laborers.....	2 50

The surface men work ten-hour shifts, with the exception of the carpenters, who only work nine hours, and hoisting engineers, who work eight hours.

The contract system is used largely in both the development work and in the stoping, and is found to be very satisfactory. The miners are paid for the amount of advance made in the former and the length of holes drilled in stoping. By this means it is found that the drills are used to better advantage during the eight hour shifts.

\*Abstract Trans. Canadian Soc. Civil Engrs.



# MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

## ALASKA.

In his annual report Governor John Brady says of the mining industry in part as follows: Somewhat of the lethargy of a political year has manifested itself in the mining industry in Alaska. Excellent properties which need enlargement and reorganization were not noticed when offered for sale in Eastern markets. Claims which are partially developed and yet prospect well received but small recognition from investors. This has been rather the prevailing tone. However, in the Berner's Bay region enough has been ascertained to encourage the whole industry, for large bodies of good paying ore have been developed, the total value of which can be accurately calculated, and it runs into millions. The blocking out of large ore bodies on these claims is being vigorously pushed, and will be carried on for some time before the proper reduction works shall be constructed. The claims more immediately north of Juneau, and those in Silver Bow basin, promise better things as development work advances.

The Rodman Bay mining properties, on the north end of Baranof island, have been thrown into the hands of receivers. The claims were discovered some years ago and a company organized. A 5-stamp mill was erected for prospecting, a wharf built and a railroad 7 miles in length—almost all on trestles, sawmill, warehouse, store and other houses erected. A fine mill, with a capacity for 120 stamps, was erected, and 60 stamps were set up. Now, after a possible outlay of \$750,000, and at the moment when the work should be turning out bullion, they are in custody of the court. Mistakes in purchases of machinery, in transportation, and in construction may be made and tolerated, but if in this instance the trouble is as to the extent and value of the ore body the men who bear the responsibility should not be excused nor pardoned; they should be blacklisted and avoided by the mining community, as such methods result in incalculable harm to Alaska's mining interests. Many hopeful enterprises are just under way and need much more capital to put them on a producing and profitable basis. A great enterprise which has cost hundreds of thousands of dollars without producing a cent in return, and suddenly thrown into a receiver's hands to wind it up, makes it laborious for promoters who have propositions of good value to get any attention whatever. Alaska has suffered greatly in this way in years past. It is to be hoped that the clubs of mine owners and mine operators, which are organizing at Juneau and other centers, will see to it that any man who has been identified with a reprehensible scheme shall be debarred, and that the capital which has been solicited and obtained for opening and developing mines shall be legitimately and conscientiously employed.

Alaska's mining laws are retarding the development of some of the best properties. In Nome it is almost impossible to buy land without a cloud on the title and even two or three titles to the same piece of property do not insure absolute ownership. The appointment of new Federal judges does not help the situation as they are only the exponents of the laws, and can do nothing to better them. At present only one mining district in Alaska is not affected by the laws, because the people of the district have taken the law into their own hands and made rules and regulations governing the purchasing, location and owning of claims. This district is the Fairbanks, near the Yukon river. There has been a big rush during the past year.

In the vicinity of Ketchikan, Manager Doly of the Unik River Mining Co., when he returns from Seattle, will have men to develop the property.

Irving, Brice & Miller are working their mine on Gravina island. The ore will be run through their own mill on the property. They are putting up a new head frame.

The Cracker Jack group has twelve men employed. The Nihlack copper mine is working thirty men. They are putting in a shaft to the beach so that the ore can be loaded on to the large boats and shipped to the smelter.

O. Grissek, at Karta bay, is driving an adit tunnel of 400 feet on the ledge.

The Mansfield G. M. Co., owners of quartz and placer claims at McGinnis creek, will continue work under Superintendent Jarrett. The company's headquarters are at Mansfield, O. They will install a tram system to handle the large boulders in the placer pits. The flume carrying a 600-foot head of water to the placers was finished last fall and has not been interfered with by the winter snow. The flume is 4x6 feet and a mile in length.

## ARIZONA.

### Cochise County.

The Copper Queen and Calumet mines are shipping 2500 tons of ore daily to the smelters at Douglas.

It is locally reported that the Phelps-Dodge interests will build a railroad from southern Arizona to the coal and coke fields of Durango, Colo.

The mill and millsites, together with four mining claims in the Turquoise mining district, and belonging to the San Remo M. Co., have been sold at sheriff's sale to M. Costello for \$30,050.

### Cocconino County.

Manager S. J. Holsinger of the Standard Iron Co.'s properties at Meteor mountain has been drilling in the bottom of the crater; recently the drill struck something that it could not penetrate and the supposition is that it is a fragment of the meteor. The drill was at the depth of 630 feet; the hole had to be abandoned and a new one started, which is now down several hundred feet. The formation is a soft sandstone saturated with

water; the only trouble in drilling is to keep the sand from coming in before the piping can be put down.

### Mohave County.

The Santa Fe has absorbed the Arizona & Northern railroad, which runs from Kingman to Chloride, a distance of 35 miles.

The Andrews-Doran Co., of Los Angeles, are promoting a smelter proposition at Kingman. They have land near McConico, 4 miles south of Kingman, and say they will there install a plant of 500 tons capacity. The process is a new one and is controlled by the G. H. Reduction Co., of which Andrews & Doran are the representatives.

Kingman reports that the Gold Bug Mining Co. has bonded its group of mines to H. J. Marmein of New York for \$150,000, and that Butler & Osborne have sold their group of copper-gold mines on Big Williams Fork for \$80,000.

Operations are to be resumed at the Golden Gem, in the Cerbat range. The Golden Gem Co. will erect a concentrating plant.

### Yavapai County.

(Special Correspondence).—The Storm Cloud mines on Mount Union, 15 miles southeast of Prescott, are to be unwatered and examined preparatory to placing hoisting machinery on the property. The Storm Cloud has an inclined shaft on the vein 200 feet deep, and on the Ten Spot a vertical shaft 100 feet deep, between two veins. Besides these developments there are numerous tunnels, small shafts and surface cuts on a number of veins. The property comprises 208 acres of mineral land near the summit of Mount Union and joins the Cash Co.'s mines, and is about 1 mile from the Senator mine. The ore in the Storm Cloud is quartz, carrying gold and auriferous iron sulphide. On the Ten Spot the ore is a mixture of copper, iron, lead and zinc sulphides in quartz gangue. This mine has produced upward of \$100,000 by primitive methods. T. C. Archer of Prescott has been making arrangements for the prospective owners.

Prescott, Feb. 28.

A. J. Pickrell of Prescott is at the Senator mine, where he has men cleaning out the long tunnel, preparatory to the installation of air drills.

A new company, it is reported, has been formed to rebuild the Val Verde smelter at Val Verde. The first work will be the construction of a sampling works. The company will not wait for the completion of the smelter, but will commence to buy ore as soon as the sampling works is in operation. The system of smelting will be different from that practiced here heretofore. The new plant will be constructed upon the lines of the new smelter at El Paso, Tex., and the plant at Agua Caliente, but will have the advantages of improvements introduced during the past two years. The company expects to have the smelter in operation in from four to six months. The capacity of the smelter will be from 300 to 500 tons per day, with provision made to increase the capacity to 1000 tons a day as soon as the ore output will justify it.

The Anderson Metals Extraction Co. has started work on a cyanide plant at McCabe, to work the large pile of tailings accumulated during the past three years. There are about 25,000 tons of tailings, averaging from \$3 to \$5 per ton in gold, and between 1% and 2% copper. The plant is expected to be in operation by May 15. The company has leased the tailings. It is claimed that by the Anderson process the copper will be precipitated and also saved.

### Yuma County.

H. J. Beemer of the Amalgamated G. M. Co. at Quartzsite has spent the past two weeks at the mines supervising operations and reports work progressing. He says they do not calculate getting the 60-stamp mill in operation before July. Beemer will put a traction train on the road. A load on a good road is fifteen tons to the car. Machinery for drilling water has arrived at Congress Junction and is being hauled 100 miles to camp. The plant consists of a boiler, engine, a 58-foot derrick and complete drilling outfit. Beemer expects by July to have a complete 60-stamp mill and concentrating plant in full operation.

## ARKANSAS.

### Baxter County.

(Special Correspondence).—Several new zinc mines have lately been developed in this county, among them the Gold Standard, which is now erecting a mill, and the Commercial mine, which is placing machinery on the ground preparatory to building a mill. Three other mines will probably have mills before summer—the Hawkeye, Mountain Pass and Huelsenbeck. Scores of prospects are being developed in the vicinity of Mountain Home which will eventually become mines.—A rich strike of zinc ore is reported from the Mountain Pass claim, 3 miles west of Mountain Home.—P. H. Gehr of Mountain Home has made a zinc strike in the Yellville district.

Mountain Home, Feb. 28.

### Marion County.

(Special Correspondence).—An elevated tramway 1 mile long is being built at the Maumee mine, in the Yellville district.—The Excelsior claim, near St. Joe, is being drilled to find the boundaries of the zinc deposit developed in this locality.—The Jimmies Creek district will ship concentrates to the smelters via the new railroad at Yellville.—Superintendent Augustine of the Davy Crockett mine, near St. Joe, made his first carload shipment of zinc last week.—The Monkey Hill mine at Yellville is opening up. The gangue runs about 40% metallic zinc and the ore assays 64%.

Yellville, Feb. 28.

## CALIFORNIA.

### Amador County.

The Jose Gulch mine at Butte City, 4 miles southeast of Jackson, has been idle for several weeks. W. E. Stewart has the management of it and has succeeded in getting the title in proper shape and mine and mill will resume operations. A run of the mill was made last month which is said to have more than paid expenses.

Superintendent Weh Smith reports the 100 stamps now dropping in the Kennedy mill. The station at the

2700-foot level is about completed, the water tank finished and preparations are being made to crosscut to the ledge on that level. The total depth of the shaft is 2810 feet, and as soon as crosscutting is begun at the 2700 level sinking will be resumed and another station cut at the 2850 level.

### Butte County.

The Mercury says that H. H. Yard and W. P. Hammon are interested in the North California M. Co., which has a large tract in Butte and Plumas counties on the North and Middle Forks of Feather river. It is proposed to dig the auriferous gravels at various points with steam shovels, load it on cars and haul it from 1 to 7 miles where it may be sluiced. Where there is available water pressure, it is proposed to wash the gravel from the cars into the sluices. The cost is estimated at 5 cents per cubic yard for digging, 1 cent per mile per cubic yard for hauling and 2 cents for unloading and washing. As the company has water power for generating electricity, the use of electrical power will lessen this cost.

### Calaveras County.

F. O. Cortmarsh of Mokelumne Hill has secured the Sport Hill mine from the owner, G. Emerson, and has formed a company of local men. This property lies below the Mokelumne Hill canal and will be worked by ground sluicing.

The Bourbon Electrical & Mining Co. is preparing to install its electrical plant on the Stanislaus river. J. Fozard, formerly of the Utica Co.'s plant, above Murphys, will put in the plant on the river for the new company. He will draft his own plans.

The Melones Con. M. Co. has a tunnel into Carson hill 5300 feet. Through an 1100-foot shaft ore from the upper levels is let down to the tunnel level, where it is loaded upon trolley cars for the mill. It takes 300 tons of ore a day to keep the sixty stamps dropping. After the addition of forty more stamps, the mill's capacity will be 500 tons daily.

The lode lying west of Altaville promises to develop several paying mines, says the Echo. Recent discoveries on the lode have proved encouraging. Some of the ore taken out of late assays well in free gold. A good part of the lode is under bond.

Work is going on on the Jones-Allison group of mines on Carson creek, 6 miles southwest of Angels. Good prospects have been found in the large ledge recently discovered there.

The Cassinelli drift mine, on Central hill, 4 miles west of San Andreas, is a good producer. A clean-up last week yielded \$1000 in gold.

A number of good gravel finds have lately been made in the gravel mines about San Andreas in a district many supposed to have been worked out years ago.

### El Dorado County.

The Oakland Development Co. has started hydraulicking on the Mameluke Hill gravel mine, 1 mile north of Georgetown. M. W. Sargent is superintendent.

### Inyo County.

(Special Correspondence).—Mines near Lone Pine are being opened by J. J. Sweeney of Colorado, who is at Lone Pine. He is the promoter of the new town of Mayette, near his property. Mount Whitney station is the nearest railroad point.

Lone Pine, Feb. 28.

### Kern County.

Superintendent Galbraith of the Yellow Aster mine, near Randsburg, says he will develop the mine's water supply to increase the capacity of its mills. At present the wells of the company supply water to run 130 stamps. The present capacity is 500 tons a day. The compressed air plant runs four machine drills.

The Sunshine mine, located in 1896 by B. M. and T. W. Atkinson, 2 miles southwest of Randsburg, has recently developed ore assaying \$100 per ton. Since striking the deposit at a depth of 100 feet, ore has been mined in large quantities to the present depth, 275 feet, which is milling \$108 a ton.

### Nevada County.

Manager Brunner, of the Conlin mine, is expected at Grass Valley, to resume operations. The pumps have been kept going and the mine is free of water. The shaft is down 700 feet.

### San Bernardino County.

It is locally reported that the smelter plant at Needles will be taken hold of by a company of experienced men.

### San Diego County.

(Special Correspondence).—The lode extending from the vicinity of Julian to Banner and beyond, in the Cuyamaca range, is experiencing one of its periodical revivals. The district was discovered by M. Julian, and he, with a number of others, formed the original district. Among the noted mines of the early days in the district were the Washington, Owens and High Peak, in the vicinity of Julian; the Helvetia, Antelope, Kentuck S. and Cincinnati Belle, between Julian and Banner, the Ready Relief at Banner and the Golden Chariot, several miles from Banner. These mines, and others of the district, have been worked in a spasmodic manner, usually by men of limited means, but they have produced many thousands of dollars. The ore is above the average in grade, and the district on the whole justifies more systematic exploration than it has ever received. At present there is one of the periodical revivals in progress. The Helvetia mine, after an idleness of several years, is again active, and it is reported in bonanza. The High Peak mine, near Julian, is again being worked and a good showing made. A stamp mill, built originally for the Cincinnati Belle, near Julian, has been removed to the High Peak. Other machinery has been placed on the mine recently. It is the intention of this company to sink a deep shaft and systematically prospect their ground. The principal drawback of the district is the lack of water, though sufficient for steam and small milling operations is obtainable. Another disadvantage lies in the fact that the ore occurs in mica schist in a series of lenses and the shoots do not occupy continuous fissures. Consequently, when a lens of rich ore is worked out, prospecting must be done to find another, and it has too often been the case that the prospecting has been deferred until there was no ore left in sight, when the mine would be abandoned until the next fellow with cash and courage would search for and find another



shoot. The mines, generally speaking, have too little ore to justify an independent mill. If several mines of the district would unite to build a joint company mill, the several mines might be able to keep the mill in continuous operation.

Julian, Feb. 25.

#### Sierra County.

(Special Correspondence).—The Empire mine, near Downieville, is now running under the superintendence of T. K. Code, E. M., who in the past three months, since taking charge of the mine, has hocked out 12,000 tons of ore, which sampled over \$7 per ton. The vein is 5½ feet wide. The 20-stamp mill is running full time and the mine is on a paying basis. Within the past three years the mine has had four superintendents, but none of them before now ever run the mill. There are other mines in this county, which, with proper management, could be placed on a paying basis in a short time, but which are now idle.

Downieville, Feb. 23.

It is reported that the Mountain mine near Sierra City will be started up by Superintendent L. H. Carver. New buildings will be put up to replace those destroyed by fire last December. He will put in a new rock breaker and an electric dynamo for power and lights.

A rich strike is reported at the Mountain mine, near Sierra Buttes. A discovery of a vein a few inches wide was made on the surface, and Superintendent Carver made a survey and directed a raise to be driven from tunnel No. 2, which cut the vein 50 feet above the level. The ore runs over \$60 per ton and is now 2 to 5 feet wide. A new tramway is to be built and other improvements made to replace those burned last fall. At the time of the fire the mill had just begun to run.

#### Siakiyou County.

C. R. Richardson has finished cyaniding the tailings of the Black Bear mine. In the past eighteen months he has cyanided 10,000 tons, from which \$15,000 was realized. He is now operating his plant on Black Bear creek with good profit.

The hydraulic mines owned by Gardner & Eastlick and Wright & Fletcher at Oro Fino are running with giants and elevators. Both companies have opened new ground for the season. The water season has been rather short, but from now on no trouble will be had.

Many acres were recently bonded around Oro Fino, which is being prospected by drill machine. It is a question as to the depth of the ground to be handled that may interfere with the scheme around Oro Fino and up to the Pinery placer claims on Kilder creek. The hydraulic lands in that neighborhood returned from \$10,000 to \$17,000 per acre.

The Gold Dyke mine is being developed by L. Monahan, and good ore is being crushed in the new 3-foot Huntington. It is averaging twenty tons of ore daily. The ledge is a large porphyry dyke, and the present plant was put on to prospect the property. It is the intention to put on a larger plant if the mine proves a success with development.

The placer mines about Happy Camp are reported working with plenty of water.—J. L. Mahan will let a contract to continue work in the upper tunnel of his property, 2½ miles southwest of Happy Camp, and will resume development in the lower tunnel. The ledge makes a good showing of ore of fair average values. A mill test of several tons of ore taken between walls some time since, without sorting, netted \$21 per ton.

#### Tuolumne County.

At the Los Angeles mines, on Tuolumne river, above Ward's Ferry, near Sonora, twelve men are employed and more will be put on. The mill is running steadily on good ore. Superintendent Kuhns says an addition of five stamps will be made to the mill, making fifteen stamps in all.

Men have been placed on the Nonpareil, near Big Oak Flat, on development.

At the Neversweat, near Big Oak Flat, there has been extracted considerable ore of high grade, which is to be taken to a custom mill.

Fifteen men are working at the Clio, near Jacksonville. The company intends to thoroughly test this mine.

The shaft in the Longfellow mine, at Big Oak Flat, has passed the 600-foot station and will be sunk deeper. Dividend-paying rock is being extracted and the quartz in sight is sufficient to feed the mill for many months.

The mill at the Experimental has started up and is in full operation. John Conlin is superintendent.

J. Gillis has taken from Jackass Hill a bar of gold worth \$235, from the Carrington claim.

It is reported that a shoot of rich ore has been cut on the 300 level in the Jumper, near Stent.

The Mount Lilly is in full operation. A change room with bathing facilities has been provided for the men. New shoes, dies and plates have been taken in for the mill and stamps will be dropping in a few days. A large quantity of rich ore is in sight and it has been demonstrated that the veins are larger and richer than they were at any place before.

The Draper mine, near Soulsbyville, is being successfully operated. Eight power drills are kept in operation day and night and forty men are employed. A larger hoist will be installed.

At Tuttle town work of unwatering the Bell mine is suspended.

### COLORADO.

#### Boulder County.

At Nederland, Superintendent Loach, of the Wolf Tongue M. Co., is producing tungsten ore. The four mines employ twenty-five men and concentrate the output in a 20-stamp mill, treating 20 tons a day, producing 2500 pounds concentrates. The mill also treats custom ore, charging \$4 per ton and paying for the concentrates at the rate of \$6 per unit. Concentrates that run 60% tungsten bring \$360 per ton; if the concentrates run 50%, \$300. Another mill in the district, at the Boulder County mine, under management of C. W. Lake, treats 20 tons a day from their own mines. Another tract is being operated by E. A. Nereshimer, the ore being supplied to the Boyd mill at Boulder, which has been recently overhauled and refitted for the purpose, and is treating 20 tons per day.

#### Clear Creek County.

The Helen tunnel in Virginia canyon, near Idaho Springs, is being driven on the vein. It was the intention of the management to unwater the old shaft after straightening up the old tunnel, but the showing of ore changed the plan for the time being, for as long as there is a good showing in the face of the drift it will be continued. All the ore taken out in driving the adit is being piled up at the tunnel mouth and stopping ground is being opened. The winze, or continuation of the shaft, which is cut by the tunnel at a depth of 75 feet, is in readiness for the hoisting plant, and it will be put in place after the face of the drift has been driven far enough to prevent injury from blasting.

Superintendent S. Griswold is working on the Lucy claim and the shaft is showing up well. The ore streak found at grass roots continues in the shaft at depth of 30 feet. There is a good streak of milling ore which would yield a profit if there were no smelting ore in the vein. An 18-inch streak of good ore has been cut in the Teller mine 800 feet from the portal.

The Stephens Co. leases on the Mendota mine have twenty-three men at work, producing an average of \$3000 a month for three years. The first-class ore runs \$45 per ton in lead, silver and gold, and is shipped to the Georgetown sampler. The mill turns out a zinc product averaging \$23 per ton, twenty-seven tons of concentrates being shipped each week to Denver. Besides running their own ore the company usually runs about 100 tons of ore for other operators. They have on one of the levels in the Mendota mine a vein of ore 22 inches in thickness and 125 feet in length. L. Stevens is manager of the Mendota mill. In saving zinc the concentrates do not run below 45%.

#### Denver County.

(Special Correspondence).—The Globe plant of the American Smelting & Refining Co. is fighting a \$100,000 damage suit in the district court. The suit is brought by a ranchman living in the vicinity of the smelter to recover damages for losses to stock and crop sustained by alleged reason of the fumes and smoke settling on his property and causing a number of the cattle on the ranch to die from the effects of eating poisoned grass. The smelter and ranch are located about 5 miles from the city.

A bill against "boycotts" and "black lists" is taking the attention of the fifteenth general assembly. Some opposition is being brought to bear against the bill on the ground that it is one-sided and will be a benefit to the employer only.

The reports the past few days are to the effect that the deep drainage tunnel of Cripple Creek district has been temporarily held up on account of lack of support. The chairman of the drainage tunnel association has been absent from the State for some time which accounts for work being suspended for a time. It is understood from one of the interested parties in the project that definite plans will be settled some time this week. It is believed from information received at this time that the tunnel is an assured fact and that all the money necessary to complete the enterprise will be forthcoming. Practically all of the opposition to the tunnel has been removed and it is now a question of raising the required amount to put it through.

Experiments are being made with vitrified brick as a lining for tube mills used in grinding ore in concentrating mills and are said to be proving satisfactory. Efforts are also being made to locate suitable material in this State for use in the mills in case brick will not answer the requirements. Most of the pebbles used come from Iceland and it is believed with the vast resources in the State that a satisfactory variety of flint can be secured here without having to send so far for the material.

It has been announced here that plans are perfected for a new \$50,000,000 smelting and mining combine to be controlled by the American S. & R. Co. The nucleus of the new company is stated to be the Guggenheim Exploration Co., which has \$13,000,000 issued stock selling for \$165 per share. Four large independent smelters will also be absorbed. The company will have \$25,000,000 common stock and \$25,000,000 preferred. The American S. & R. Co. will acquire control of 51% of the stock of the new company for the consideration of a guarantee on a small portion of the preferred stock, which charge will not exceed \$300,000 per annum. No new securities of the American Smelting & Refining Co. will be issued.

Denver, Feb. 28.

#### Fremont County.

The output of the Florence oil field for 1904 was 265,000 barrels. A number of wells have been capped, and the probability is that the output for 1905 will be below that of 1904.

#### Gila County.

Returns from a shipment made last week by A. Kaneppely, working in the 420 west level of the East Notaway mine, returned 22.07 ounces gold, 4.45 ounces silver to the ton, this being among the best shipments of high-grade ores made from this property for some time. L. Mills and F. Crispin, working a block of ground in the west 555-foot level, have opened up fine ores in sinking a winze and the streak carries values of from 15 to 20 ounces gold per ton. J. Hopkins, working in the 555-foot level above where the winze is being sunk, is taking out ore, and McCullough & Hardy will also make a shipment of high-grade ore. Sinking under contract in the shaft is fast nearing the 700-foot point. They have had a large crevice in the shaft, and it is believed when the levels are run in the bottom that good ore bodies will be found. The property is being operated by the Town Topics G. M. Co., and has paid \$50,000 in dividends within the past four years.

Missouri capital is interested in the Missouri & Colorado M. & M. Co., operating the Snowdon property near the head of Silver creek. Sinking has been suspended for the present and drifting is under way. In the drift the vein matter is from 3 to 3½ feet in width, with 7 to 8 inches of smelting ore, carrying average values by shipments of three ounces gold per ton, the balance being a concentrating proposition, with values from \$10 to \$12 per ton. W. C. Hollister is manager.

There are twenty men employed at the Mackey mine

by the Imperial G. M. & M. Co., under the management of L. J. Mountz. Regular shipments of two or three cars are being made weekly to Argo, these ores averaging \$20 to the ton. Another carload shipment of high-grade ores will be made to the smelter, the last car of high-grade ore returning \$207. The high-grade ore is being taken out from the east 150-foot level, and in sinking a winze at that point Manager Mountz reports they have a streak of high-grade ore coming in from the foot wall side.

#### Hiosdale County.

Miller & Co. of New York will develop the Black Swan mine, north of Sherman and east of Argentum.

#### Lake County.

(Special Correspondence).—There were shipped from the mines of the Leadville district during February 73,000 tons of ore, a slight increase over the January tonnage. The bulk of this ore was low grade. There has been some increase in the shipments of high-grade carbonates from the downtown district and from Rock hill. The principal shippers and their average tonnage are the Iron Silver M. Co., 12,000 from the Moyer; Western M. Co., 250 tons per day from the Coronado and Midas, and about 300 per day from the A. Y. & Minnie, Adams and other properties; Yak M., M. & T. Co., 8000 tons from the Silver Cord, Tankerstown and Bob Ingersoll; Reindeer, 3500 tons; Ollie Reed, 4500 tons; Small Hopes M. Co. and lessees, 3000 tons; Ihex and lessees, 6000 tons; Penn properties, operated by lessees, 3000 tons; Fryer Hill M. Co., 4500 tons. The balance of the tonnage comes from small properties operated principally by lessees.

The Iron Silver M. Co., operating the Moyer, North Moyer, Tucson and Dome, has declared a dividend of \$50,000, payable March 4. Last year this company paid \$350,000 in dividends, although the average value of the 150,000 tons of ore mined was less than \$10 a ton, and \$150,000 was expended upon development and surface improvement.

Development of the new territory recently opened up on Rock hill is being retarded by unexpected flows of water. Nearly all of this territory has been drained to a depth of 400 or 500 feet by the Coronado and Penrose pumps, and the shafts on the higher portions of the hill are dry to that depth. The Nil Desperandum, which is being sunk by the Rock Hill M. Co., struck a flow of water at a little less than 700 feet. The United No. 1, which is being sunk by the United M. & D. Co. of A. on the George H., has also encountered a steady water course, and other properties in that vicinity have cut into small streams. While these courses are not large when compared with those from which the downtown pumps are lifting 700 to 800 gallons per minute, they are heavy enough to interfere with operations and create a demand for pumping machinery.

The Empire Tunnel Co. of Georgetown is operating the old Cloud City shaft in the downtown district. The Cloud City and the Home Extension properties, which this company has secured, lie to the west of the Western M. Co.'s downtown mines, adjoining the Coronado, Midas and Penrose. The Empire Co. is spending \$150,000 in sinking the Cloud City shaft to the second contact to open up the extension of the Coronado shoots. The shaft is now down 630 feet and will go 75 feet deeper. A station is being made at the 630-foot level and a 500-gallon pump will be installed at that point. The mine is now being drained by a 300-gallon pump, but, being much lower than the Penrose, the company is preparing for possible danger from an increased flow. In the old upper levels of this mine low-grade ores have been taken out, a particularly fine body of manganese having been worked last year. W. S. Jones is superintendent, F. A. Maxwell of Georgetown general manager, Clarence Jarbeau of Georgetown secretary. The plans of the company, as announced when it took charge of the Cloud City, include the building of an independent smelting plant to treat the ores from its properties in Clear Creek county and from the Cloud City, the Leadville ores being desired for their fluxing qualities.

The development of the new Rock hill section is progressing, and March is expected to see the surface plants and machinery installed for the sinking of new shafts on the Parson claim by F. H. Minard and his New York associates; on the Rock Hill Con. group by F. Bulkley of Denver, and on the Revenue ground by T. F. Daly of Denver.

Leadville, Feb. 28.

#### Ouray County.

The Ben Hur group in Sneffels mining district has been sold to a company of St. Louis capitalists. The property consists of eight claims, located between the Camp Bird and the Revenue mines. While very little work has been done on it, it is considered valuable because of certain known veins intersecting it.

#### Sao Juan County.

The Creole Belle group of claims passes to the Ross M. Co. This group, consisting of the Creole Belle, Grand Duke and Oracle claims, is near the Sunnyside mine, near Eureka, 10 miles up the Animas river from Silverton. The claims were located twenty-five years ago. The property has considerable development and the richness of the mineral zones has been established, although the work up to this time has been confined chiefly to surface workings. A year ago sixteen carloads of ore from the group was shipped to the smelter, and returns averaged over \$60 to the ton, mostly in gold. The Ross M. Co. is a new organization and has been operating in this county for a year or so, but in that time they have become the owners of some valuable mining ground. Among them is the Galty Boy group, up Cement creek. Development work on the Creole Belle group will be continued. It is expected a mill will be erected this summer.

#### Summit County.

There is talk of several dredgers being put up on the Blue on the Lamhing ground, now owned by the Blue River Excavating Co. There is also report of one or more dredgers being built on this property and one or more on the ground controlled by the company at Dickey.

The Gold Pan Co. is doing all possible to get an early start. The drainage flume run by the Mekka Co. will



be completed to the pit started by Mr. Kingsbury. During the continuance of the work on the flume, which will not rest on bedrock until it reaches the pit, a hydraulic lift will be used to test and clean the bedrock along the course of the flume, using it to carry off the gravel.

Never before have the prospects for placer mining looked as encouraging as now. The heavy falls of snow so far this winter are already sufficient to guarantee plenty of water with which to carry on operations during the summer, and some companies are already making preparations to resume. Work will be started as soon as conditions permit. On the Blue, Swan and French rivers placer operations will be pushed.

At Breckenridge the Germania G. M. Co. is incorporated by T. R. Keith and H. S. Bonchhoff of Breckenridge and W. O. Pratt of New York. Main office is in Breckenridge; main workings, Georgetown district. J. G. Goodier of this place, W. C. Off and C. A. Kellogg of Breckenridge, have incorporated the Abundanco M. & M. Co. They will develop properties near the Old Union, Oro and Wellington on Mineral hill.

#### Teller County.

A new body of ore has been encountered on the Anaconda property. The shoot was cut 6 feet below what is known as the Howard flat vein, which belongs to the Mary McKinney Co., and like the McKinney vein is flat. The find was made by Anderson and associates, who have been working on the McKinney ground, and believing that the vein was going into Anaconda territory the manager of the Anaconda Co. offered them a liberal lease on that section of ground, which is known to the Anaconda estate as block 46. The lessees, going to work through the Anaconda main tunnel level, soon opened up the body of ore. Their assays indicate that the ore will run better than three ounces to the ton. What is known as the Howard vein has been worked at different points and has always proved a success. These operators have opened up a large body of ore where it is believed the values of the Howard vein have shifted to a lower vein.

High-grade ore has been found at 1100 feet in the American Eagle's shaft of the Stratton's Cripple Creek M. & D. Co. on Bull hill. The find was first opened on the Shurtloff claim, 50 feet west of the main vein of the Findley Con. Co. The ore streak is from 12 to 15 inches in width. The new vein is believed to be the old Garfield Grouse vein that in the early days proved a good producer.

It is calculated by Mason & Murphy, lessees of the Monte Cristo, on the northwest slope of Beacon hill, that they will need to sink 160 feet before the extension of the rich shoot, opened in the El Paso near by, is encountered. A depth of something over 100 feet has to be attained. Another lift will probably have to follow to provide stopping ground. Work is being energetically prosecuted.

Operations have been resumed on the Fountain Valley claim of the Banner G. M. Co., under lease to Crowder, Wilder & Co. Suspension was necessitated by water.

In the proposed new drainage tunnel, Cripple Creek mine owners favor driving it, as outlined in plan No. 2. The committee in charge propose to raise funds to push it several hundred feet farther to the east than was originally planned, so that the mines near the Victorator may benefit therefrom. It is figured that a tunnel, driven 750 feet below the level of the present one, would add ten years to the life of the Cripple Creek mines.

Many Cripple Creek miners are going to South Africa with F. Renfrow, a representative of a number of South African mining companies. Each man has signed a contract for three years. They are to receive \$5 per day; board \$4.50 a week.

The Solar M. Co. has a bond and lease on the Ollie Placer and Last Chance lodes on Mineral Hill and has opened a body of ore. The lease runs eighteen months. The operators have been interested in Mineral hill for a number of years, always believing that it would yet give up a producer. They opened the present body of ore at a depth of 30 feet from surface, where the vein has been proved up for a width of 15 feet, returning average values of \$10 to the ton for the entire body of ore. The lessees believe they have found the source of the placer gold that has from time to time been panned in this neighborhood. A plant of machinery has been ordered and they expect to commence building a large shaft house. This find, together with that recently made on Copper mountain on the Buckeye, means much to Cripple Creek, as this territory is located contiguous to the city.

S. S. Bernard, president of the El Paso Con. G. M. Co., denies that negotiations are pending with English capitalists for a controlling interest in the company. The El Paso company was incorporated in 1894. The gross production of the property up to the first of this year was \$3,036,311. The gross production during the last six months of 1904 was \$752,235, and the net production \$661,308. Construction of an addition to the El Paso ore house is nearing completion. The new part is nearly ready for use. It is calculated by Superintendent Bainbridge that the addition will increase the facilities in this department by 50%.

### IDAHO.

#### Boise County.

Judge Stevens of the district court signed an order directing Receivers C. N. Clark and W. Mathews to sell at public auction all the properties, including waterworks, electric railroad, smelter and mining property, of the Great White Knob Copper Co. of Mackay, Idaho. The value of the property is estimated at \$2,800,000. There is a mortgage upon the property of \$1,000,000, and the court directs that the minimum bid holds the \$1,000,000 lien, but the court directs that all creditors shall be paid out of the proceeds of the sale. About \$50,000 of the claims are held in Salt Lake City. Other creditors are Denver and Butte firms, whose claims aggregate \$70,000. The receivers have set the sale for March 18th, at Mackay, Idaho.

#### Idaho County.

The Hewey Kearns property on Rapid river, in the Seven Devils, has been bonded to Ohio men for \$40,000.

The new owners will drive a crosscut tunnel to open the vein at depth.

#### Owyhee County.

Near Silver City the Sinker tunnel, in charge of Manager Wilson, employs thirty-five men. The management have installed water jacket drills.

In the Commoner mine, J. H. McGowan manager, the pay streak averages 16 inches wide. The ore, without culling, runs \$230.

In the property owned by the Golden Opportunity M. Co. work has been temporarily suspended. The president is F. D. Kendrick of St. Paul, Minn. Work will be resumed about May 1.

#### Shoshone County.

Regarding the strike on the Snowshoe, one of the copper properties of Mullan, the Press hears that 2 feet of ore carries 11% copper. This, with the silver values it carries, brings it up to \$40 per ton.

Near Thiard the Wake-Up-Jim, at the head of Trail creek, is to have a stamp mill and cyanide plant.

It is expected that the Rox (Sixteen to One) M. Co. will resume May 1, when there may be sufficient water for the mill; if not, the mill will be run by electricity. When work is resumed it is thought there will be employment for 150 men.

A strike is reported on the Black Horse property, 5 miles east of Murray—a vein of ore 3 feet wide. The property is owned by Manley and Pettiford.

#### Washington County.

The mining men of the Big Creek section are agitating a State road into that district from Warren, the road to be built jointly by the State and citizens of the district.

The Pueblo group, of which I. H. Friar is superintendent, is on Smith creek, in the Big Creek district. He has had five men at work this winter and has sunk a shaft 80 feet and drifted 60 feet from the bottom; 50 feet of this drift is in ore assaying from \$2.80 to \$570.40 per ton. It is free milling and the richer ore lies in bunches. Mr. Friar states that he has shaken some of this over a canvas and the gold would drop from it. They have other tunnels in the group that are being driven but have not reached the ore. The company will put a 10-stamp mill in this season.

### MISSOURI.

#### Jasper County.

(Special Correspondence).—The Kansas City-Joplin M. Co. has a mine on the Schifferdecker land at Chitwood and has resumed operations.—Patten & Dodge of Joplin have started their new \$12,000 electrical mill on the Vancil land, south of the city. Power for the mill will be furnished by the Spring River Power Co. The Patten & Dodge mill is the first in the district to use electricity.—A large body of high-grade zinc ore has been struck at the Holy Smoke No. 2 mine at Carterville.—A good zinc prospect is being opened up on the Stickney lease, north of Webb City, by W. H. Scott & Co. The mine for the past two months has made three tons per shift with five hand jigs. A new mill will probably be erected at the mine this summer.—The lease of 140 acres of land on the Billingslea, Law & Dick land, 2 miles west of Neck City, owned by Malang & Phillips of Joplin, is being developed and is proving rich.—The American Lead & Zinc and the Yellow Dog mines at Carterville will install new screens at their mills.—The Amazon M. Co.'s land, comprising 560 acres, near Joplin, owned by C. M. Wilson of Joplin, will be developed. There are six companies holding leases on it.—Several new concentrating mills will be erected in the vicinity of Carterville and Webb City this spring, and work in the mines there promises to be lively in both prospecting and producing. The mills which it is now assured will be erected are those of Ball & Gunning at Neck City; Luke & Brown at Alba; John Durby at Alba; Portland M. Co. on the South Portland at Webb City; George W. Moore et al. on the Jewel C lease on the Missouri Zinc Fields ground at Webb City; the American Zinc, Lead & Smelting Co. on their Blanket vein ground at Carterville.—F. M. Weeks of Colorado Springs, Colo., is in the district, organizing a company to prospect and develop his 120-acre mineral tract, near Carthage.—The Hancock M. Co. of Joplin, which purchased the Sunset lease, is sinking a shaft on a drill hole which showed a rich run of zinc ore. The lease is a part of the Murphy land, 1 mile southeast of Joplin.

Joplin, Feb. 27.

### MONTANA.

A stipulation has been entered into between Attorney-General Galen, representing the State, and W. F. Meyer, attorney for H. Griffith of the Gebo coal mines, that were closed by the State by injunction proceedings on the ground that the law was not being observed, that will permit the resumption of work. The stipulation recites that the company will within thirty days comply with the demands of Coal Mine Inspector Welsh. The resumption is chiefly allowed that coal, which is very much needed, can be mined.

#### Fergus County.

J. A. Drake of Chicago has taken up his bond on a portion of the North Moccasin properties. This was done after 4000 feet of diamond drill prospecting. The North Moccasin lies between the Kendall and Barnes-King mines, which have yielded enough to make Fergus the banner gold producing county of the State.

A rich strike has been made in the Liverpool mine, 15 miles south of Helena, one car of ore yielding \$25,000. The ore averaged 8000 ounces of silver to the ton. The mine is operated by T. G. Merrill of Salt Lake and a Mr. McAuley of New York.

The Montana New Mines Co., operating the sapphire mines, produced \$350,000 worth of gems last year.

A strike has been made in the extension of the Bertha mine, near Wickes, three 6-inch veins being uncovered, which averaged \$100 a ton in gold.

#### Flathead County.

Reports from Snowshoe mine, near Libby, in which Spokane men are interested, are to the effect that the company has decided to sink 250 feet deeper. One hundred and fifty men are at work developing the group.

If development is satisfactory the property is to be further equipped with machinery.

#### Granite County.

S. I. Riches, owner of a parallel lead to the Nancy Hanks claim at Garnet, has had the initial carload shipped from his claim, which netted \$10,000, the values being in arsenical pyrites. The Mitchell & Mussigbrod properties in the same district are said to have \$150,000 worth of similar ore blocked out.

#### Jefferson County.

Gold ore running \$20 a ton has been found in the properties of the Gold Rose Co. Development has shown the vein to be 50 feet wide. A rich streak in the Blue Jacket, an adjoining property, shows ore assaying \$360 a ton. It is the intention of the companies to put in a cyanide plant for the treatment of the low-grade ore.

#### Lewis and Clark County.

Secretary Edgerton of the Bald Butte Co. has issued the annual report, which confirms recent reports of rich strikes in that property. The Bald Butte was for years the leading gold producer of the State. It was then reported worked out. The report of Mr. Edgerton shows that two new veins have been discovered, which yield richer ore than did the two which made the property famous. The 30-stamp mill began operations on Feb. 20, and enough ore is said to be in sight to keep it busy for a year. Nearly \$30,000 was expended in development work last year, but the operations showed a profit.

#### Madison County.

R. C. Knox, manager of the Revenue M. Co., Virginia City, tells the Madisionian that when the Revenue mine work resumed it will be worked by the leasing system entirely. He thinks that is the most co-operative way a mine can be worked, as he claims the miners then share in the profits of the mine. On the lower levels, where there is some dead work to be done, the company will board the leasers and furnish all material except sharpening the steel, while the dead work is being carried on or until the ore bodies are encountered. The basis of rates is as follows for the Revenue and Monitor mines, showing the possible earning for lessees:

Ore Value Per Ton	Lessee's Returns Per Ton	No. Tons Per Day	Bring Lessee Per Day
\$ 7.00	\$2.00	3	\$ 6.00
8.00	2.75	3	8.25
9.00	3.50	1½	5.25
10.00	4.00	1½	6.00
11.00	4.50	1½	6.75
12.00	5.00	1½	7.50
13.00	5.25	1½	7.87
14.00	5.50	1½	8.25
15.00	5.75	1½	8.63
16.00	6.00	1½	9.00
17.00	6.25	1½	9.37
18.00	6.50	1½	9.75
19.00	6.75	1½	10.12
20.00	7.00	1½	10.50

These figures are only approximate and will have to be improved upon in some places of the workings.

#### Missoula County.

The King & Queen M. Co. has been incorporated to operate the claims of the company near Carter. The claims are said to contain pay copper and gold ore.

#### Silver Bow County.

(Special Correspondence).—It has been reported that the copper output of the Butte district for 1905 will show a material falling off and that Montana must look to the copper resources of the Corbin district in Jefferson county, if she desires to keep up her record. To those who know the facts this is amusing. There are promising copper prospects in the Corbin district, but they have not as yet passed beyond the prospective stage, and the outlook for a material production from them is at this time a remote contingency. On the other hand at least three producing mines have been added to the list in Butte within the past year, and a full knowledge of the underground condition of Butte's mines makes it possible to predict a very probable increase in tonnage and output of metal in 1905. Concerning the settlement of the surface on which the city of Butte is built, no mining operations whatever are actually in progress now within 100 feet of the surface, and the settlement which has occurred in the past is by no means such as to cause any alarm. Only a very small part of Butte is undercut by any considerable amount of mining development, and this at such a great depth as not to affect the surface more than in a very slight way.

Butte, Feb. 25.

At the Washoe smelter in Anaconda there is being constructed the largest copper furnace of its kind in the world. Its total capacity for twenty-four hours will be 1600 tons, including all of the charge except coke. To build the furnace it has been necessary to join two of the ordinary furnaces together. The work is progressing under the direction of General Manager P. Mathewson, Assistant Manager Hamilton and the superintendent of the blast department, S. Gormally.

### NEVADA.

#### Esmeralda County.

(Special Correspondence).—New strikes are being reported daily through this section. A large amount of milling ore is being developed, and several mills are building, while others are in contemplation. Water is being developed by means of wells sunk along the granite contact, between Columbia and Goldfield. The Cimarron claim has a high board fence around it. From this mine was recently shipped 3 tons of ore by express, which, it is said, contained \$15,000 per ton. More people are coming into the district every day, and building is progressing as fast as materials can be secured. The camps hereabouts are greatly inconvenienced by the inability of the transportation companies to handle the freight.

Goldfield, Feb. 26.

(Special Correspondence).—The Silver Star mine, comprising the Douglas group, 7 miles west of here, has been sold by C. D. Van Duzer and associates for \$50,000—\$10,000 cash, \$20,000 in thirty days and \$20,000 in sixty days. The Bounce mine, the property of the Lothrop-Davis Co., is also sold for \$22,000 cash.

Sodaville, Feb. 27.



## Eureka County.

C. Allen has a lease and a bond on the Oneonta mine, near Cortez.

## Lincoln County.

De Lamar's mines at De Lamar are to have an extensive cyanide plant for the treatment of tailings. The proposed plant will be capable of treating 20,000 tons of tailings per month. Thirty leaching tanks will be installed, of which eighteen will be of steel, the remainder of wood. The material will pay an average of \$2 per ton, according to the statement of Manager Swindler. There will be no crushing, while the material will be handled along the most inexpensive lines. To the ordinary method of leaching, Mr. Swindler has added a number of devices that promise a close recovery. It is thought that the cost of treatment will not exceed 60 cents per ton.

Scott & Miller of Boston, who recently bought the Abe Lincoln mines and mill at Pioche, and got a bond on the Mendah property, are credited with intention to expend possibly \$200,000 in Pioche, this to include the purchase price of the mines and their equipment. The milling ores are now being tested.

## Nye County.

A new strike of importance is reported in the Midway mine at Tonopah. It is said that in the congestion on the railway at Reno there is now tied up 450 carloads of freight, with Tonopah, Goldfield and neighboring camps as its destination. It is said that the railroad will be into Goldfield within the next four months, while the broad-gauging of the system is progressing as rapidly as possible.

A shipment of high-grade ore has been made through Wells-Fargo from Tonopah. The ore was from the Tonopah-Extension and the Midway mines.

The News says that the Carson & Colorado railroad is broad gauged to Wabuska. Narrow gauge cars will not be run farther than that point in the future. The Southern Pacific company will arrange for through service from Wabuska to Sparks. A joint traffic arrangement will be made with the Virginia & Truckee railroad whereby the Southern Pacific trains will run through over the Virginia & Truckee tracks from Mound House to Reno. The Southern Pacific is figuring on running a line from Sparks, to tap the Virginia & Truckee road at Huffaker's Station. Preferred runs are to be given with broad gauge trains running from Wabuska to at least Mound House. Standard gauge engines and other equipment are arriving for the operation of traffic in that territory. Surveyors have been in the field running a line from Wabuska for the straightening of the road. The new work will soon commence of broad gauging to Sodaville, but under the reconstruction Hawthorne will be off the new line about 3 miles.

The Tonopah Railroad company will make their road standard gauge in time to operate trains when the Southern Pacific get their reconstruction work to Sodaville.

The Goldfield News reports a number of new strikes, and that the list of shipping mines is increasing.

The Combination company is sacking from the shoot opened at surface, 200 feet south of the shaft. The shoot is 18 inches wide, and will average \$300 per ton. Thirty inches of sulphide ore, carrying gold, have been exposed in the shaft on the Spearhead at a depth of 104 feet.

At the Florence, in the north drift, the ledge has widened to 16 feet and 5 feet of high-grade shipping ore is being broken. The output is 10 tons daily. The shaft is being put down to the 300-foot level. With stopping under way the entire 16 feet of ore will be broken down and extracted.

The Adams district now awaits better milling facilities.

A mill of 40 stamps is proposed for Goldfield, to be built by the H. L. Frank company of Butte, Mont. G. R. Potter is manager and Frank Enzensperger, superintendent of construction.

Mr. Enzensperger will first ship in machinery for a testing mill, to work five-ton samples. If necessary all branches of ore reduction from amalgamation to chlorination will be taken up. It is the company's present intention to put in a 40-stamp mill when the experimental stage has been passed. The location of the mill has not been decided on, several available sites being under consideration.

## Washoe County.

J. Gregory of Olinghouse has leased the Addie C. to Golding, Fraser & Wetmore of Wadsworth for \$25,000. The Springfield M. Co. is piping water to their claims.

## NEW MEXICO.

## Grant County.

The second furnace of the Silver City Reduction Works has been blown in for a trial run. The ore supply at the smelter has been cut short owing to the bad condition of the roads, and until there is some improvement, the second furnace will not be put in commission. The new 250-ton furnace for the smelter has been shipped and the foundation for the engine to run the blower has been completed. The Whitewater Copper Mining Co., C. P. Laughlin, manager, will resume development of its fifteen claims in Whitewater canyon, Burro mountains. The tunnel on the Black Hawk will be run 200 feet, as the surface showing is good.

Regular shipments are being made from the Arizona and Manhattan at Pinos Altos by L. P. Deming, who has leased the properties, but the bad roads will compel cessation of the shipments for the present. The shipments average from ten to twelve tons daily.

Manager Brandis has started up the Mammoth mill, 1/2 mile north of Pinos Altos, and is running on ore from the forty leasers on the Comanche property. The ore is crushed by the stamps and run on the tables, where it is concentrated. The concentrates are shipped to the Silver City Reduction Works. The mill was built twelve years ago to treat the ore from the Mammoth mine.

The Detroit Co. has received three carloads of machinery for the placers in Whitewater canyon, 1 mile below Fort Bayard.

Work has been resumed on the Hanover mine by

Phelps-Dodge Co. The property was acquired by the company several years ago, but permitted to lie idle. Now shipments will commence to the smelter at Douglas, Ariz. There are also 25,000 tons of ore on the dump, which will be shipped.

The Colorado Fuel and Iron Co. is employing 125 men at its Fierro mines.

A high-grade streak of lead sulphide, carrying silver values, has been opened up near the Old Man mine; assays run as high as 500 ounces of silver and 40% lead to the ton.

A 35,000-pound No. 6 Root blower is being installed at the Comanche smelter at Silver City. From its Burro Mountain and Pinos Altos properties the company is making regular shipments to its smelter. At the former property several 500-foot shafts are in progress.

## Otero County.

A smelter for Alamogordo is being discussed. W. A. McIvers, a mining man of Lincoln county, says all conditions are favorable. In the Gallina mountains is a large amount of copper-lead ore; the Jack mountains have great quantities of iron and copper ores, and the Jicarilla district, gold, copper and iron. Lone Mountain, near White Oaks, carries iron in abundance and some copper, and the White mountains contain copper, gold and lead ores. The Ocuras district has good copper propositions and the San Andres, copper and lead. For fuel, the White Oaks and Patos fields, when opened, would supply the demand for coal and coke for years, beside the Capitan and Dawson fields and the Hagan field, the latter tributary by the Santa Fe Central connection. Alamogordo has water and railroad facilities. Mr. McIvers is opening large bodies of copper and iron ore in the Jicarilla district for a Wisconsin company. He says the mines must have a smelter this year.

## OREGON.

## Baker County.

J. W. Long, who has been examining the California mines in Cable Cove district, thinks that with proper operations it will become a prominent producer. The California group is composed of twenty claims, upon which a large amount of development work has been done. A large mill has been built by the company, but he thinks it is equipped with the wrong kind of machinery for treating the ores. In the mines about 4000 feet of tunnel work has been completed. The ore body ranges from 10 inches to 4 feet in width and will assay about \$65 per ton.

The Iron Dyke mine and Northwest Railroad, on Snake river, are reported to have passed back into the control of C. M. Reed and Mrs. Shatto, and through them the property will be conveyed to the Standard Oil Co. by H. H. Rogers. It is said that Rogers has secured control of the Searles mines in the Cornucopia district, and that the Standard Oil will hereafter predominate the interests of the mining camps to the east of Baker City, covering especially the gold and copper producers and the transportation down the Snake.

## Benton County.

The Freeland Con. M. Co., with headquarters at Salem, is preparing to develop its properties in the Santiam district. It is the intention to install a leaching plant this season. F. H. Colpitts, who has been in Colorado for a year making a study of leaching plants, has recently become interested with the company and is directing work. The company owns ten claims on Gold creek, a tributary of the Little North Fork of the Santiam, about 18 miles from Gates, on the Corvallis & Eastern Railroad. There is considerable ore in sight in the mine workings.

## Douglas County.

At the annual election of directors and officers of the North Fairview M. Co. at Eugene, a report of conditions was rendered and plans discussed for future operations. The company has 1800 feet of tunnels, the longest one of which is in 400 feet. Good values are found at this depth, the ore being mostly free milling.

## Grant County.

At Prairie City, the Dixie Meadows management will resume milling. There is a hard blue quartz in a part of the higher grade rock. This, when mixed with the heavy talc on the foot wall, presents a difficult milling problem. The 60% of values carried in sulphides further complicates the case.

## Jackson County.

The new 10-stamp mill at the Lucky Queen mine in the Gold Hill district is about completed.

D. B. Grant has bought the Sweepstake Extension claim of T. W. Hill on Wagner creek.

The Oregon Belle mine is to have a new stamp mill to be operated with electric power.

A. C. Hooper of the Mt. Pitt M. Co. states that he has eight men at work and are running their arrastra night and day with good results, and that on their placer mine on Bummer gulch they have a No. 1 giant at work, operated by 400 feet of 8-inch pipe under 100-foot pressure.

The Enterprise M. Co., near Woodville, are preparing to start their mill. F. Trowbridge of Baker City is manager. This company is operating the old Homestake mine.

At Woodville the Homestake will resume. Superintendent Trowbridge thinks steam power can be dispensed with, and electric energy from the Gold Ray line taken when the line is completed en route to Grants Pass. The property is owned by the Enterprise M. Co.

The Oregon Belle property, near Jacksonville, is to have a stamp mill. Foster and Gunnell are managers.

## Josephine County.

The old Jewett mine on Mount Baldy, near Grants Pass, abandoned for a long period, will be opened up again and developed by underground workings, and equipped with a reduction plant, cyanide tanks, etc.

The 100-ton smelter at Taklima will start up next month. The smelter has a capacity of 120 tons daily and will be operated full blast. Men are employed in both the Queen of Bronze and Cowboy mines blocking and removing ore as a reserve supply for the smelter.

## Lane County.

Near Cottage Grove the Vesuvius 10-stamp mill has

been closed for the present. Superintendent Jenks reports that the lower tunnel is progressing rapidly.

At Blue River, C. Parks, manager of Treasure mine, will put in a milling plant. He says the first mill will be an experiment, and later will build a larger one.

## SOUTH DAKOTA.

## Lawrence County.

(Special Correspondence).—The district from 4 to 7 miles south of Perry, and about half way between Perry and Rochford, is attracting attention as a field of unusual prominence. The Montezuma mine on the south and the Clover Leaf on the north, are characteristic of a large part of this area. The formation is largely hydro-mica schist of deep red color, similar in appearance to that on the surface on the Homestake belt, and quartz veins and silicified zones are of frequent occurrence. Moreover, in early days considerable placer gold is said to have come from the tributaries of Box Elder creek, which drains this region. About 3 miles north of Rochford copper prospects are good, but have received only superficial development. The formation is black slate and quartzite. The section is not well watered by large streams, which is probably the principal reason why more prospecting has not been done here. Rochford, Feb. 24.

The Myrtle Dell M. Co. was recently organized and incorporated under the laws of South Dakota, says the Miner. The officers are: W. I. Harmon, president, and J. J. Donnelly, secretary and general manager. The company owns 17 locations in the Ragged Top district, between Crown Hill and Spearfish canyon, near Preston. The Burlington road from Englewood to Spearfish is accessible to the group, and there is a millsite on the claims. The principal development consists of a shaft and three tunnels in ore. The company has several buildings on the mine. The shaft is down 132 feet in a phonolite dyke. A tunnel 1000 feet southeasterly from the shaft has been driven in an easterly direction 168 feet with a view to tapping the dyke in a different place. Another tunnel is being run to tap the dyke farther west from tunnel No. 1, about 350 feet from where a small gash is known to exist. Tunnel No. 3 is being driven north to tap the dyke. Work is now in progress.

At a recent meeting of the Black Hills Mining Men's Association, C. W. Merrill, metallurgist of the Homestake Co., said that ore was being crushed in the Amicus mill, 240 stamps, operated by the Homestake Co., for 13 cents per ton. The ore is crushed to a 35 mesh. The Homestake Co. is now treating ore that averages \$3.70 a ton.

## UTAH.

## Beaver County.

Manager M. M. Johnson of the exploration department of the Newhouse mines and staff are making a careful sampling of the properties of the Majestic C. M. & S. Co., near Marysville, with a view to ascertaining what the needs of the properties are. The Old Hickory and Harrington & Hickory belong to the Majestic.

The Horn Silver zinc plant at Frisco, which cost about \$200,000, has begun operations. In the Horn Silver mine is considerable zinc ore. Should this prove satisfactory the Daly-Judge mine will also install similar equipment.

## Juab County.

Tintic ore shipments for the week ending Feb. 25th were as follows: Centennial Eureka, 48 carloads; Bullion-Beck, 6; Gemini, 13; Ajax, 4; Carisa, 3; Grand Central, 5; Mammoth, 10; Victor, 3; May Day, 2; Uncle Sam, 2; Yankee Con., 5; Eagle & Blue Bell, 9; South Swansea, 2; Star Con., 3. Total, 104 carloads.

## Salt Lake County.

The North Bingham M. Co. has incorporated; capitalization, \$50,000; J. E. Frick, president; G. L. Bemis, treasurer; F. O. Frick, secretary; F. Bemis, vice-president.

Manager D. C. Jackling of the Utah Co. says of the new tunnel connecting with the All's Well mine that the length of the tunnel is about 1800 feet to where it connects with the shaft, and gives us an outlet to the surface in two places, and also enables the extraction of ore from the All's Well ledge through the main tunnel workings. It is not the intention at the present to draw on the All's Well for ore, not at least until we continue the drift already started 200 feet farther and do some more crosscutting. The shaft is 120 feet deep, but back of it the workings on the ledge will make depth rapidly, as the mountain soon becomes precipitous. From the All's Well shaft to the Ohio side lines the distance is about 600 feet, and there is ore all the way.

The local rumor that the Ohio Copper Co.'s Bingham properties are about to pass into the hands of the Guggenheim Exploration Co. of New York is denied by Manager Catrow of the Ohio properties. It is reported in New York that control of the interests of the Guggenheim Exploration Co. will pass into the hands of the American S. & R. Co.

At the Utah & Eastern mine, when sinking of the double-compartment shaft is finished, the smelter will resume operations.

## Summit County.

The Daly-West meeting in Denver showed the mine to be in good shape. The treasury reserve is reduced to \$284,148.45, or \$190,847.83 below what it was at the beginning of the year. Of the \$170,000 decrease in revenues, or difference in treasury reserve, over \$100,000 went into the construction of the wrecked ore bins, mill enlargement and machinery purchase account, leaving \$50,000 to be charged to dividend account. The receipts of the company from all sources during the year were \$2,280,139.75, as against \$2,643,747.52 during 1903, a decrease of \$363,697.77. From the sale of ores and concentrates the company received during the year \$1,804,673.83. The figures show that the concentrates and crude ore produced were both worth more per ton than they were in 1903, the better work of the mill being reflected in concentrates worth \$4.10 per ton more than during the year previous. Of the regular grade of crude ore, 23,355 dry tons were shipped. It contained 1,023,831 pounds of copper, 11,335,964 pounds of lead, 1066.50 ounces gold and 1,578,924 ounces of silver, which sold for \$885,169.30. During the time the Quincy works were operated 14,440



tons of ore, carrying 450,452 pounds of copper, 4,547,278 pounds of lead, 692.33 ounces gold and 625,168 ounces silver, was sold for \$305,600.75. The concentrates produced amounted to 15,207 dry tons, containing 541,340 pounds of copper, 9,616,557 pounds of lead, 607.88 ounces gold and 848,652 ounces silver, which sold for \$605,738.65. A new product, known as mill crude, which comes from the sorting belts introduced into the plant a few months ago, amounted to 267 tons. This ore carried 7382 pounds of copper, 151,665 pounds of lead, 9.59 ounces gold and 11,490 ounces silver, and sold for \$8164.13, or \$30.58 per ton, net. The concentrates brought \$39.83 per ton, the Quincy crude \$21.16 and the regular crude \$31.22 per ton. The total dividends paid this year amounted to \$1,044,000, while the total paid to date by the company is \$4,635,000. This is practically 50% of the mine's production from the beginning, which has been \$8,955,512.07.

## WASHINGTON.

### Stevens County.

Superintendent A. I. Goodell of the Northport smelter has started an extra furnace at the Northport works, making three of the five furnaces of the Le Roi smelting plant.

## FOREIGN.

### BRITISH COLUMBIA.

The employees of two smelters are on strike as the result of the defeat of the bill for an eight-hour day. The men from the Greenwood and Boundary Falls plants in the Boundary country are out, and it is expected that before the end of this week there will not be a smelter running in full blast in the province. The men think they can follow the tactics of the miners who secured an eight-hour day several years ago after a long and bitter strike. The other smelters, where it is feared trouble may come early this week, are the City Hall mines smelter at Nelson, the Canadian smelting works at Trail, the Tye and Crofton smelters on Vancouver Island, and the Granby smelter at Grand Forks. There are over 1000 men engaged in the smelting institutions in this province. The owners are determined not to give in, so that a long struggle is feared.

It is expected that smelting at the new plant of the Sullivan Group M. Co., at Marysville, will begin next week. The second furnace—a duplicate of the first, with a capacity of 200 tons of lead ore daily—is expected to be running April 1.

### Boundary District.

It is said the automatic electric feeding device installed at the Granby smelter will save the labor of eighty men.

Returns from the last car of ore sent out by the Sky-lark to Nelson smelter returned \$93 per ton.

It is stated that 375 feet of drifting and 140 feet of crosscut in the new shoot of ore in the Mother Lode mine has failed to show any walls.

Drifting is now in progress north and south from the 45-foot level of the Bay shaft. A large amount of free gold and tellurides continues to be found in the ore. Shipments will be made.

The recent shipment of twenty-four tons of ore from the Sally mine, west fork of Kettle river, treated at the Trail smelter, ran over 200 ounces silver, besides small gold values. Shipments will be maintained all winter. There are large reserves of ore on the dump.

### Cariboo District.

(Special Correspondence).—A specimen of the scheelite (tungstate of lime) especially reported to the MINING AND SCIENTIFIC PRESS of Jan. 28, as having been discovered near Barkerville, this district, has been brought down from Hardscrabble creek by H. H. Cleugh, a miner. The sample consists of a small bottle filled with a sand composed of small irregular grains of quartz, colors of gold and specks of magnetite or hematite. It occurs in a seam coming through the slate formation of the district. The seam varies in width from 4 inches to 4 feet. Next to the seam is a quartz ledge, and it is inferred that the seam itself is not a filled fissure, but that a portion of the quartz through which it is said the scheelite is disseminated has become decomposed. The portion of the quartz ledge not so affected has remained hard, though it has been ascertained by breaking the quartz that the scheelite is distributed through it in veinlets. There is no quotation for scheelite given so far as known, but it is stated that it is worth 60 cents per pound, and that additional value is given to the mineral because of a deposit of hematite in the district. The mineral is used in the manufacture of steel. Mr. Cleugh is forwarding the sample to the Toronto University for analysis. About 200 feet, according to Mr. Cleugh, have been uncovered.

Barkerville, Feb. 24.

Forty ounces of coarse gold from the Hardup claim on Grouse creek have thrown Barkerville into excitement. The gold goes \$20 to the ounce, and this display of \$800 worth from a claim that was considered worked out has set the old timers thinking. J. Wendle obtained the gold in nuggets varying in size from \$75 to pieces worth a few dollars. It is thought that Wendle has found accidentally the famous Heron lead, which in the early days of Cariboo yielded rich returns. Of late years little has been done on Grouse creek, except by the Waverly Co., which paid a dividend in 1904.

### Lardeau District.

The Lucky Boy is being reorganized and is to be known as the Chestnut Hill M. Co. The Lucky Boy is shipping ore.

At Camborne the Eva mill has resumed and forty men employed in mine and mill. At the Oyster-Criterion mill, owned by the Great Northern Mines, Ltd., preparations are making for adding ten stamps. On the Silver Dollar, of which J. A. Darraugh is manager, a compressor plant and concentrating mill is being put in. On the Beatrice, near Camborne, a large force is employed, considerable ore is being taken out and rawhiding is in progress. The ore of the Beatrice is high grade and will stand an expensive haul.

### Kootenay District.

J. R. Bottorff, representing the American M. Co. of

Elwood, Ind., has secured hydraulic leases and plant on French creek, Kootenay, from W. Cowan. The new American owners will begin work at once. The flumes and the headgates are being repaired and the plant overhauled.

### Rossland District

It is reported at Rossland that a new ore shoot has been found in the White Bear mine. It was found in an upraise, making from the 1000 to the 700-foot level. The ore is high-grade, and ten carloads have been extracted. It is thought the shoot is extensive, and will go into ground that has not yet been explored.

The total shipments from Rossland for the past week were 6315 tons, while the total for the year to date was 46,666 tons.

A mining deal has been completed at Revelstoke whereby the American M. Co. of Indiana acquires the leases and hydraulic plant on French creek. With this new concern at Revelstoke this season there will be four American companies operating placer leases in the Big Bend gold fields.

The new crusher of the Mother Lode, near Greenwood, with a daily capacity of 900 tons, has been put into commission. The former crusher will be removed to a site beside the new one and repaired in time to meet the increased demand to ensue upon enlarged smelter facilities.

Fine copper ore is being shipped from a 30-foot ore body in the Emma.

## MEXICO.

### Chihuahua.

W. C. Greene of Cananea is reported to have bought the Santa Juliana gold-silver mine in the Ocampo, or Jesus Maria district. It is expected that its purchase by Col. Greene, together with 46,000 acres of timber land, other mines and the water power of the Falls of Basichic, will put new life into the Jesus Maria camp, which has been a regular producer since 1816 when it was discovered. The price is said to be \$438,000 gold. It was bought from the Belvanera M. Co., in which J. C. Beatty was prominent.

For eighty-eight years the camp has been producing at a profit with a 90-mile pack haul to overcome, and until the Chihuahua & Pacific was built to Minaca in 1899, all supplies went from this city, 125 miles farther.

### Coahuila.

Construction work has begun on a smelter at Saltillo. The Mazapil C. Co. has a concession from the State, which has donated the site and water supply for the undertaking and also other privileges, such as the exemption from certain taxes.

The smelter is being built southeast of the town, near the crossing of the Coahuila and Pacific and National lines. Concepcion del Oro, San Pedro de Ocampo, Mazapil, and other mines will send their products to this smelter.

This smelter project was first promoted, fifteen years ago, but the proposition has always hung fire till now.

### Oaxaca.

The Chihuahua Enterprise learns that T. I. Ryder, who holds the concession for a smelter in Oaxaca, will commence work for the erection of the plant within sixty days. It is claimed that the site is purchased. He has resigned his position as manager of the Waters-Pearce Oil Co. to take effect April 30, after which time he will devote himself to the smelter enterprise.

### Sonora.

The Transvaal smelter, located 15 miles west of Cuppas, in the Moctezuma district, has been blown in. L. Cloud, formerly of Nogales, is general manager, and O. H. Neahr, superintendent.

H. C. Gerber is at Toledo, where the smelter is blown in and operations resumed. Mr. Gerber, formerly of Parral, is general manager, and J. Barney, assistant.

W. E. Jones of the Cerro Azul M. Co. has returned to the company's properties in the Cerro Azul mountains to resume operations with a large force of men.

## NEW ZEALAND.

Returns for the year show a slight falling off in the gold hullion output. Apart from this apparent decrease in the gold return, the industry has been advanced.

During 1904 the Auckland gold fields produced hullion worth £834,880, as compared with £902,503 for 1903.

The Waihi G. M. Co.'s mine has produced to date £632,256, as against £618,699 for a similar period of 1903.

## Personal.

GEO. G. MERRICK of Denver, Colo., is now at Monte Cristo, Ariz.

H. H. MCCARTHY is now manager of the Golconda mine, near Sumpter, Or.

G. R. HANCOCK is manager of the Ferry-Hancock properties, Park City, Utah.

RICHARD A. PARKER, E. M., has returned to Denver, Colo., from Salt Lake, Utah.

C. H. DOOLITTLE is now manager Bingham-New Haven mines, Bingham, Utah.

W. E. THORNE is now in charge of the Snow Storm Hydraulic M. Co., Fairplay, Colo.

THE Gold Roads mine, Kingman, Ariz., is now under the management of H. G. Heffron.

T. K. CODE is superintendent of the Empire mine, near Downsville, Sierra county, Cal.

ATWOOD BENTON of Parral, Chihuahua, Mexico, has returned from a trip to Denver, Colo.

J. PINKHAM has been appointed assayer Boise, Idaho, assay office, to succeed H. S. Wooley.

H. J. MEISEL, M. E., formerly assayer at the Rawhide mine, Tuolumne county, Cal., is now connected

with the New York & Honduras Rosario M. Co., San Juanito, Honduras, C. A.

O. W. PIERCE, formerly of Lake City, Colo., is now with the S. H. Supply Co. of Denver, Colo.

C. H. FULTON succeeds R. L. Slagle as president of the State School of Mines, Rapid City, S. D.

FRANZ MEYER is planning a smoke-consuming plant for the Utah Con. smelter, near Murray, Utah.

LEWIS SEARING, manager of the Denver Engineering Works Co., has returned from New York City to Denver, Colo.

F. A. O'HAGAN of the A. S. Cameron Steam Pump Works, New York City, has returned there from Denver, Colo.

WM. BAINBRIDGE, superintendent of the El Paso Con. G. M. Co., Elkton, Colo., has returned there from Denver, Colo.

S. I. HALLETT of Colorado has returned from Brazil and is visiting the Dos de Abril mine of Heffran & Piper, Chihuahua, Mex.

FRANK ENZENSBERGER, superintendent of the H. L. Frank Co. of Goldfield, Nev., is in San Francisco, Cal., arranging to buy a mill for his company.

R. C. TURNER of San Francisco, Cal., has gone to the Dolores mine, Chihuahua, Mex., to relieve Manager Hardy, who takes an extended vacation.

R. A. TREVARTHEN, former manager Portland mine on Battle mountain, now has charge of the Forest Queen property, Ironclad hill, Cripple Creek, Colo.

HANK SUMMERS, first mayor of Nome, is in Goldfield, Nev. While in Alaska he cleared up \$460,000, which he lost in other ventures. His pocketbook was so thin that he walked from Tonopah to Goldfield. He has located several properties at Lida, and hopes to make another fortune.

## Trade Treatises.

Steel Wheelbarrows is part of the story told by the Archer Iron Works, 34th Place and Western Ave., Chicago, Ill., in their booklet thereon.

"Westcott Chucks," standard, 6x9, red and gold, 32 pages, bound, illustrating lathe chucks and drill chucks. Westcott Chuck Co., Oneida, N. Y.

Catalogue No. 20 from the Allis-Chalmers Co., Milwaukee, Wis., graphically portrays their Reynolds Corliss engines in their various styles and designs.

Catalogue 10 A., from Colorado Iron Works, Denver, Colo., treats engagingly of cyanide plants, machinery, tanks and appliances. Every one of its 82 pages is of interest.

Catalogue No. 35, from the S. H. Supply Co., Twenty-second and Larimer, Denver, Colo., contains 100 pages illustrated description of second-hand mining machinery of all kinds.

Catalogue No. 21 of the Weber Gas & Gasoline Engine Co., Kansas City, Mo., describes in detail the Weber suction gas producing plant and the Weber cylinder vertical gas engine.

Publication No. 117, "Gates Rock and Ore Breakers, Styles D and F," from the Allis-Chalmers Co., Milwaukee, Wis., is fully up to the high standard set by that company in its publicity department.

Jos. Dixon Crucible Co.'s "Graphite," a monthly publication, is in a class by itself. It contains good-humored matter as well as technical information, and will be sent from the company's office, Jersey City, N. J., on request.

Wood stave pipe is treated of in an illustrated brochure from the National Wood Pipe Co., 301 Market street, San Francisco, Cal., and Sixth and Mateo streets, Los Angeles, Cal., with testimonials of merit thereof, and descriptions of recent installations.

"The Yellow Streak" is the unique title of a lemon colored leaflet issued by the Broderick & Bascom Rope Co. of St. Louis, Mo. Primarily advertising that firm's make of wire rope, it incidentally gives additional information. Among other things is brought out that at the St. Louis Exposition they were awarded the grand prize on wire rope.

The Hardsocg Wonder Drill Co.'s latest catalogue describes in detail the Little Wonder air hammer rock drill. The booklet will be sent on request from the main office of the company, Ottumwa, Iowa, or their representatives, Rix Compressed Air & Drill Co., San Francisco, Cal.; H. L. Sinclair, 1744 Broadway, Denver, Colo.; H. P. Fogh, 1602 Railroad avenue, Seattle, Wash.; Irish & Chandler, 119 1/2 So. Spring St., Los Angeles, Cal.

Harron, Rickard & McCone, 21-23 Fremont St., San Francisco, Cal., have issued a third edition of their catalogue No. 5, "Hydraulic Mining Machinery," illustrating and describing the Campbell gravel elevator, water lift, mining giants, sluices, riffles, water gates, pipe, etc. Some carefully prepared tables regarding flow of water, loss of head in pipes by friction and other technical data are a notable part of the treatise which forms the latest addition to their list of issued catalogues.

## Obituary.

OSCAR O. BENSON, a pioneer of Granite district, Or., died February 22 at Portland, Or., from a surgical operation. He was at one time one of the principal operators of the Red Boy mine, near Sumpter, Or.



## Commercial Paragraphs.

THE advertisement of the Ingersoll-Sergeant Drill Co. in this issue was first choice in the advertising contest recently conducted by the publication department of that company.

J. L. STANNARD of the National Wood Pipe Co., who has just completed a large installation in western Washington, has gone to Olympia, Wash., where the company is about to put in a large manufacturing plant.

CHAS. W. CROSS, M. E., E. E., formerly of the Roberts & Abbott Co. of Cleveland, Ohio, has entered the employ of Crocker-Wheeler Co. of Ampere, N. J., and is attached to the Cleveland office of the company, 816 New England Building.

J. D. HELM has resigned the superintendency of the Penoles M. Co., Mapimi, Mexico, and will be manager of a branch house in Mexico City of the Power & Mining Machinery Co. of New York. He is succeeded at Mapimi by O. R. Whitaker of Denver, Colo.

W. R. PERRIN & Co., Forty-sixth and Loomis streets, Chicago, Ill., have installed a large filter press in the plant of the Echo M. Co., Mojave, Cal. It is a 40-inch hydraulic closing press, 32 feet long, with fifty 3-inch chambers. It weighs twenty-five tons. It is operated by a belted hydraulic pump.

N. C. BONNEVIE has returned to Denver, Colo., from a month's trip in the East. The firm of Bonnevie & Lee has been dissolved and N. C. Bonnevie is now conducting the business of same. The Denver Ore Testing & Sampling Co. will be conducted as heretofore. N. C. Bonnevie has been elected president and general manager.

PRESIDENT JOHN C. WHITE, of the Pacific Coast Hardware Dealers' Association, has arranged for the meeting of the members of the Association at the St. Francis Hotel, San Francisco, Cal., from March 8th to 10th. He says the important matter of action then will be upon the proposed regulation of the railway rates by Congress.

THE agency for the A. S. Cameron Steam Pump Works of New York, N. Y., is now held by Cary & Fielding of 1711 Tremont street, Denver, Colo., who state that they will carry in Denver a stock of pumps and repairs. During the past month they report the sale of five Rand compressors of which they are the agents for Colorado and adjacent territory.

CONTRACT for compressed air power plant, to be used in driving the second pair of trolley tunnels under the Hudson river, N. Y., has been awarded to the Ingersoll-Sergeant Drill Co., making a total of thirty-eight Ingersoll-Sergeant air compressors, with an aggregate capacity of 117,234 cubic feet of air per minute, now used in building the various tunnels under the Hudson and East rivers.

C. M. FUELLER, 1752 California street, Denver, Colo., is receiving bids on lumber and other material for a 300-ton cyanide plant to be erected at Silver Cliff, Colo., for J. W. Northrop of Chicago. This is said to be the first mill in the State to adopt fine crushing. After the ore goes through the crushers and rolls it passes through tube mills, and crushed fine, and then put through filter presses. Mr. Fueller will have charge of the construction work of the mill.

COLORADO IRON WORKS CO. of Denver, Colo., reports the following orders and shipments: Complete sampling and smelting plant, with steel building, for the Mowry Mines Co., Arizona; hot blast, copper matteing and smelting plant for the Lost Packer M. Co. in Idaho; shipment of six carloads of material for the 200-ton smelting plant of the National Metallurgical Co. in Mexico; and concentrating machinery, consisting of impact screens and supplies, for the Kootenay Ore Co. and the Jackson Mines Co., Kootenay district, B. C.

WHAT the manufacturers state is the largest high head centrifugal pump ever made in one unit, built by the Byron Jackson Machine Works of San Francisco, Cal., for a large mining company in Oregon, was shipped last week. The pump is of the series five-step type, built to withstand a pressure of 250 pounds per square inch, or a total lift of 580 feet, and is to supply 9000 gallons of water per minute. It is driven by four 400 H. P. turbine water wheels, direct connected, and is made for the purpose of delivering the necessary water to a battery of giants that will operate on gravel deposits.

AMONG recent shipments made by the American Concentrator Co. of Joplin, Mo., they report the following: Complete equipment for a 300-ton copper concentrator for the Union C. M. Co., Copperopolis, Cal.; complete equipment for an entire concentrator to the Carthage M. Co., Carthage, Mo.; to F. B. Holmes, Boulder, Colo.; one New Century crusher and two sets New Century belt-driven rolls; complete concentrating plant for lead and zinc ores to the Monarch C. & M. Co., Barnett, Mo.; complete concentrating plant for treating lead and fluor-spar, consisting of New Century crushing and rolling machinery, to the Cave-in-Rock M. Co., Cave-in-Rock, Ill.

C. S. SIEFERT, representing the La Harpe Smelting Co. of La Harpe, Kan., and the A. B. Cockerill Zinc Co., is in Chihuahua, Mex., trying to purchase zinc ores. He says the zinc fields of Missouri, where high-grade concentrates are made and where the zinc smelters of the States have heretofore been getting their supply, are no longer able to supply the increased demand. The smelters must look elsewhere. The smelters in the natural gas fields of Kansas, where most of the zinc is smelted, until recently would treat very little sulphide ore assaying less than 50% zinc, with a heavy penalty for iron. Now they will handle anything from 25% up, with small penalty for iron, which gives a market for the large bodies of low-grade zinc sulphide (black jack) in the western part of Mexico

and the United States, heretofore thrown away as worthless. Colorado produced \$4,000,000 worth of zinc ore last year and that State is coming to the front rapidly in zinc production. British Columbia has also become a great zinc producer. Since the yield of precious metals has diminished in that country, the Government offers a bounty on zinc ores. Many large bodies of low-grade zinc sulphide, intimately connected with galena, are found in the western part of Mexico, principally in the States of Chihuahua and Durango.

## Latest Market Reports.

SAN FRANCISCO, March 3, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 27½d (standard ounce, 925 fine); New York, bar silver, 60c, refined (1000 fine); San Francisco, 60c; Mexican dollars, 51c, San Francisco; 48½c, New York.

COPPER.—New York: Standard, \$15.60; Lake, 1 to 3 casks, \$15.60@16.50; Electrolytic, 1 to 3 casks, \$15.50; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £68 5s spot per ton.

The export of copper to China, presumably for the Japanese market ultimately, continues strong as ever from the United States. An authority estimates that the existing contracts call for at least 50,000,000 pounds or more, and he states further that he has no doubt that China absorbed from the United States and Europe during the past six months at least 150,000,000 pounds. Until the war is over there is no prospect of any diminution in the demand.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 5s ½ long ton.

SPELTER.—New York, \$6.20; St. Louis, \$6.30; London, £24 2s 6d ½ ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$28.60@29.00; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, 32½c@35c. London, £131 ls.

PLATINUM.—San Francisco, crude, \$18.50 ½ oz.; New York, ingot, \$19.50 ½ Troy oz. Platinum ware, 75@82c ½ gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 ½ flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.75c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., 10c.

NICKEL.—New York, 55@60c ½ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ½ lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.85@17.10; gray forge, \$16.85; San Francisco, bar, 3c ½ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c ½ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1c ½ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail.) Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; latb, 4 eet, \$4.50@5.00; pickets, \$21.00; singles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city ½ bbl.

CEMENT.—Imported, \$2.15@2.65 ½ bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 ½ bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 8½c; Hallett's, 8½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ½ set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ½ lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 ½ lb.; hyposulphite of soda, 3@3½c ½ lb.; caustic soda, in drums, 3@3½c ½ lb.; Cal. s. soda, bbls., \$1.10@1.20 ½ lb.; 100 lbs., sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½@2½c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c ½ lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c ½ lb.; nitric acid, carboys, 8c ½ lb.

OILS.—Linseed, boiled, bbl., 55c; cs., 60c; raw, bbl., 55c; cs., 58c; Lucol oil, boiled, bbl., 50c; cs., 55c; raw bbl., 48c; cs., 53c. Kerosene—Pearl, per gal., 19c; As; tral, 19c; Star, 19c; Extra Star, 22c; Ecocene, 21c, Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c, do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphta or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c ½ lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ½ lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ½ lb.

MOLYBDENUM.—Best, \$2.75 ½ lb.

CHROMIUM.—90% and over, ½ lb., 80c.

PHOSPHORUS.—American, ½ lb., 70c.

SILVER.—Chloride, ½ oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ½ lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Per lb., \$2.75.

MAGNESIUM.—Pure, N. Y., \$1.60.

SODIUM.—Metal, ½ lb., 50c.

BISMUTH.—Subnitrate, ½ lb., \$2.10.

URANIUM.—Oxide, ½ lb., \$3.50.

MERCURY.—Bichloride, ½ lb., 77c.

TUNGSTEN.—Best, ½ lb., \$1.25.

FIRE BRICK.—Domestic, carloads ½ 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, ½ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING FEBRUARY 21, 1905.

783,167.—CANNED FRUIT PROTECTION—T. J. Atkinson, San Francisco.  
783,009.—ELLIPSOGRAPH—H. C. Barnes, Oakland, Cal.  
783,239.—VEHICLE BRAKE—D. Berry, Fishrock, Cal.  
783,012.—SWIMMING DEVICE—Bredermann & Howald, San Francisco.  
783,094.—GAGE—H. D. Blakeslee, Upland, Cal.  
783,177.—HYDRAULIC LIFT—G. F. Cluff, Lodi, Cal.  
783,029.—FIREPROOF BUILDING—Depew & McCoy, San Francisco.  
783,271.—DRAFT EQUIPMENT—E. F. Domerwith, Davisville, Cal.  
783,034.—TRACTION WHEEL—F. Gerling, Portland, Or.  
783,035.—DRAFT APPLIANCE—F. A. Gerling, Portland, Or.  
783,195.—ELEVATOR—Harrison & Diel, Stockton, Cal.  
783,037.—ENGINE—N. P. J. Herby, Oakland, Cal.  
783,963.—CABINET—J. P. Hird, Redlands, Cal.  
783,969.—RATCHET SWIVEL—Kunny & Arundell, Los Angeles, Cal.  
783,055.—LUBRICATOR—P. Le Sueur, Calabases, Cal.  
783,066.—VEHICLE AXLE—P. Le Sueur, Calabases, Cal.  
783,404.—TAP—C. Lewin, San Francisco.  
783,211.—FLY PAPER HOLDER—J. O. Maddux, Bakersfield, Cal.  
783,067.—AIR DIFFUSER—T. Mahoney, San Francisco.  
783,063.—FIRE ESCAPE—D. G. McClay, Santa Ana, Cal.  
782,984.—NUT LOCK—McKinnon & Neely, Eleanon, Cal.  
783,218.—SAND BLAST—J. D. Murray, San Francisco.  
783,231.—CONCENTRATOR—O. B. Perry, San Francisco.  
783,222.—KILN—J. H. Regan, Tacoma, Wash.  
783,075.—WEIGHING MACHINE—E. H. Richardson, Ontario, Cal.  
783,226.—ARTIFICIAL LIMB—J. E. Seeley, Los Angeles, Cal.  
783,323.—ORE CRUSHER—F. P. Snow, Los Angeles, Cal.  
783,336.—ENGINE—C. R. Twitcheell, Dayton Heights, Cal.  
783,161.—BURNER—L. B. & H. B. Webster, Los Angeles, Cal.  
783,348.—INSULATOR—E. C. Wright, Portland, Or.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

ENGINE TRANSMISSION AND REVERSING DEVICES.—No. 783,037. Feb. 21, 1905. Nels P. J. Herby, Oakland, Cal., assigned to Gretchen Herby of same place. This invention relates to an apparatus for the convenient and easy transmission of power from a motor, means for varying the speed of the transmission, and means by which the motion may be reversed without the interposition of a number of gears or equivalent transmitting mechanism. The object of the invention is to provide for the reversing device and for changes of speed without the use of a multiplicity of expensive gears, with resultant loss of power by friction.

ELLIPSOGRAPH.—No. 783,009. Feb. 21, 1905. H. C. Barnes, Oakland, Cal., one third assigned to A. T. Spence, Alameda, Cal. This invention relates to an apparatus which is especially designed for the production of ellipses or similar curved outlines, such as are employed in the draftsman's profession. It consists of an ellipsograph having in combination a pair of pivoted supporting legs, a pivotally mounted third leg and means whereby it is restricted in adjustment in a plane bisecting the maximum angle formed by the supporting legs, and a slidable sleeve and marking point revolvable about said third leg, and other details of construction.

ELECTRIC AIR-DIFFUSING DEVICE.—No. 783,057. Feb. 21, 1905. T. Mahoney, San Francisco, Cal. This invention relates to a device which is especially intended for the diffusion of air or other fluids, either hot or cold. It consists in a combination and arrangement of mechanism whereby currents of air are caused to pass through a spirally disposed electrical heater and are directed to points where such a current is desired. The object of the invention is to provide an apparatus which is especially designed as a heater for apartments in cold weather and which may be equally well employed for cooling in warm weather.

FIREPROOF BUILDING CONSTRUCTION.—No. 783,029. Feb. 21, 1905. C. M. Depew and H. E. McCoy, San Francisco, Cal. This invention relates to improvements in fireproof building constructions, and particularly in flooring, ceiling and partition structures. Its object is to simplify, cheapen and lighten construction without in any way detracting from the stability and permanence of the finished structure. With this construction it is possible to whiten and finish the walls and ceilings the same day they are put up.

## Dividends.

The Bunker Hill & Sullivan M. & C. Co., dividend No. 89 of \$150,000, payable to-day; total paid since Jan. 1, 1905, \$300,000; total to date, \$2,571,000.



# MINING AND SCIENTIFIC PRESS

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## Mine Drainage.

No problem with which the mining engineer has to deal is of greater importance than that of mine drainage. Where this can be accomplished by adits at reasonable cost it is done, but there are so many mines the workings of which are far below the drainage level of the country in which they are situated that the drainage question is often one of paramount importance. In the metal mining regions of the world, a few years ago, pumps were almost universally employed for this purpose, and the Cornish pump was generally preferred. This preference was so strong that types of Cornish pumps could be found performing service at mines under all sorts of conditions, from the little 4-inch jack head, handling the water of a shallow mine, up to the tremendous installations of the Comstock Lode, in Nevada, costing millions of dollars and successfully raising the hot water from those mines, but at great expense for power and repairs. In more recent years the Cornish type of pump has largely given place to reciprocating pumps, driven by steam, compressed air, or water. The pumps of this type possess the advantage of greatly reduced cost of installation, as compared with Cornish pumps of equal capacity, and flexibility of plant, which was not readily attainable with the Cornish system of mine drainage. Lower operating cost is also in their

favor. Still more recently electrically-driven pumps have proven economical in first cost, reasonably expensive in operating cost, while developing an efficiency which makes them compare favorably with other pumping systems. In the meantime bailing by means of skips of proper size and construction has grown steadily in favor, and this system now is

largely used in the coal mines of the Eastern United States, and is coming into more general use in the metal mines of the West. The power available for handling mine water is not always applied to the greatest advantage, and the method successfully applied at one mine may not be applicable to another where the conditions are different. The cost of

power, shaft room, and many other details, require consideration when figuring on drainage installation. There have been many experiments with the various types of pumps and other devices for handling mine water in the West, but there appears to be no unity of idea in regard to the best system for all conditions, and it is improbable that any single method of dealing with the water problem will find universally advantageous application. Each case must be treated in accordance with existing conditions.

In determining upon the system to be adopted in mine drainage by mechanical means, it should be remembered that the unknown and unknowable conditions which may be encountered are among the most important factors to be provided for. There are so many unforeseen contingencies which may arise that it is usually good business economy to provide a plant having considerably greater capacity than is required at the time of making the installation, particularly if it is the intention to go to a greater depth.



No. 1—Tonopah Club Mine. No. 2—Sandstorm Mine. No. 3—Ore Team Leaving the Sandstorm, Goldfield, Nev. (See Page 150.)



Combination Mine, Goldfield District, Nev. (See Page 150.)



Jumbo Mine, Goldfield, Nev. (See Page 150.)



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IN the consideration of the future development of mining and metallurgy, one can not help reviewing the past, and particularly the more recent past. There are few, who in the busy rush of to-day and in the preparation for to-morrow, stop to think for a moment what we were doing yesterday. The possibilities of the future can not be altogether gauged by the accomplishments of the past, but to some extent an idea of the future may be gained by such retrospection.

ONE of the most important acts of the fifty-eighth Congress, which has a bearing on the mining industry, was the passage of the act reserving two and a half million acres of timber land from entry by means of scrip, and prevents the selection of timber lands in lieu of lands which have been included within forest reserves, and hereafter the lands selected in lieu of such forest reserve lands must be untimbered lands. This act has been signed by the President and will save a vast area of timbered lands from wanton destruction by private owners, the most of whom are corporations. Over 2,000,000 acres of such timber lands have been taken up under the lieu lands act since its passage in 1897.

AN important consolidation of copper mining interests is reported as having been consummated at Bisbee, Ariz., in the merging under one management of the Calumet & Arizona, Calumet & Pittsburg, Lake Superior & Pittsburg and Pittsburg & Duluth mining companies. The object of consolidating these properties is to reduce the expense of copper production, by placing them all under one general management, and by greatly increasing the producing capacity of both mines and metallurgical works. The Calumet & Arizona is at present the only one of consolidation actually producing copper, but the ore reserves of the other properties are stated to be large.

## Small Electric Plants for Mines.

The transmission of electric power has done much to aid in the development of the mining industry of the West, particularly in the less accessible regions. It has cheapened the cost of power in most instances, both by direct application and through the medium of competition, with other kinds of power. The greater amount of electric power is supplied by large distributing companies, and the cost of power to those purchasing it from these companies is uniformly less than the cost of other kinds of power previously used. There are, however, many situations where mines can put in their own generating plant and still further reduce the cost of power. It is not suggested that a small plant will develop power at a less cost per unit than a large plant; but the larger power companies sell power at a considerable profit, and it is the saving to themselves of this profit that the individual mining companies may often accomplish by the installation of their own plant. The requisites are a constant supply of water and a situation where a pole line may be safely constructed and cheaply maintained. It is not absolutely necessary to success that a large head of water be available, if a large volume be obtainable. Under low head a large volume of water will generate cheap power, and in mountain regions a sufficient head to develop several hundred horse power may usually be obtained every few hundred yards. This idea conceives the employment of 2500 to 8000 cubic feet of water per minute, under a sufficient head to generate 200 H. P. to 500 H. P. The amount of power obtainable with a given quantity of water varies with the head. There are many factors to be taken into consideration in the contemplation of this problem, and the whole matter should be investigated carefully before any steps are taken to change existing conditions. In California, where are some of the largest electric plants in the world, which transmit great power at high voltages over a distance of hundreds of miles, the first installations were small individual concerns. The first to be installed was a small plant on the American river to supply light and power to the Dalmatia mine, in El Dorado county, and one of the first large electric installations by a single company in that State was that of the Standard Con. Company at Bodie, Mono county. The first has been discontinued for several years, as the mine was closed down. The second is still in successful operation. There are numerous other and successful private electric installations in California, as well as in other States of the West, and the surprise is that there are not more of them.

EFFORTS are constantly being made to reduce the cost of mining. For years it was the practice to carry all the ore from the levels to the surface on cages, or to dump the ore directly into skips from cars. These practices have been largely superseded by cutting loading pockets and chutes beneath the levels at shaft stations, and skips have in many places displaced cages. Trimming by men and animals has in many large mines been displaced by mechanical or motor haulage. In the operation of these methods, endless ropes or chains for mechanical haulage, and electric or compressed air motors are employed. More recently steam shovels, long in use in surface excavations, have been introduced into underground workings, it is said, with satisfactorily economic results. Still later came the automatic continuous loader, which carries the muck from the floor of the drift up into a car which, when full, is trammed to the station, its place being taken by another. The latest device in mining economy is a car provided with a steel shield which is run to the face to be blasted and the rock is thrown by the force of the blast directly into the waiting receptacle. At first thought the idea seems impracticable, but the defects, if any exist, will probably be remedied by the inventor who was bold enough to conceive such a scheme.

WITHIN the past week silver has taken a material drop both at home and abroad, though there is no apparent reason for such decline. Silver has become a commercial metal, like copper, and these sudden, though small, changes in prices may be expected, the price being regulated by the law of supply and demand, or by a speculative market.

## The True Basis of Value.

Large acreage is not a synonym of great value in mining possessions, though there are many, apparently, who incline to this belief, presumably on the theory that "if a little is good, more is better." This is largely the case in some localities, it is true, as for instance in many coal mining regions, and where such conditions obtain as are found in the Lake Superior copper region and on the Rand in South Africa. In these instances large areas of surface territory are underlain by mineral-bearing beds of great persistency, but of variable value, so that even in such cases, the outcome is somewhat speculative until proven. In the ordinary mining district, where fissures, zones and deposits are the typical forms of ore bodies found, a large area does not always signify unqualified success, as is abundantly proven by notable failures where there were hundreds of acres in the property. While this is a truism that cannot successfully be disputed, it does not signify that a mining property of small area may not prove a great bonanza. On the Comstock Lode at Virginia City, Nev., some of the smallest claims produced a great deal of money. At Randsburg, Cal., the Wedge mine, a small fraction, turned out many thousands of dollars, nearly all of which was profit. Instances might be multiplied indefinitely. The Goldfield camp in Nevada affords a score of examples showing that large values may come from a very small superficial area. Size is not the proper basis for estimate of the value of mining property, but the amount and value of ore actually in sight, together with the reasonable probabilities for the existence of more ore that has not been sufficiently exposed to render its measurement possible. The three measures of value adopted by careful and experienced engineers, "positive ore," "probable ore" and "possible ore," are the only safe means of arriving at definite information concerning the value of a mining property, and this can only be determined by close inspection and sampling of the mine and not by the measurement of the surface boundaries with a view to ascertaining the superficial area included in the property.

IN the middle of February last there were actually in the mines of the Rand, in South Africa, over 27,000 Chinese laborers, and more than 7500 were on the way, the most of whom have arrived at their destination by this time. Of the total number imported the mortality has been about 1.5 in a thousand, and it is not improbable that some of these would have died had they remained in their native land. In looking at these figures, and considering the statement that the Chinese are rapidly improving and becoming efficient workmen, it looks as though the importation of the Chinese had solved the labor problem on the Rand. The output of the mines of the Transvaal for 1904 is stated by the Transvaal Chamber of Mines to have been 3,779,621 fine ounces, the greatest ever made in one year since the opening of the mines. The number of men employed in December last was 134,105, of whom 15,962 were white men, over 97,000 natives and about 20,000 Chinese. Over \$15,000,000 worth of machinery was placed on the mines during the year, of which about two-thirds went to new mines. Among the recent installations is a hoist of the Whiting type having cylindro-conical drums with 20 feet maximum diameter diminishing to 12 feet at the smaller end. This machine is operated by steam, and is designed to hoist a load of 15 tons at a maximum speed of 4500 feet per minute from a depth of 4000 feet. Another installation to be made which is an innovation is found in one of the coal mines of the Transvaal, where the vein lies at an angle of 19°. The coal is to be sent to the surface on a belt conveyor, having a length of 525 feet between the centers of the reels. It is expected in the near future that the cost of power on the Rand will be reduced somewhat by the construction of large distributing electric plants.

THE term "mining expert" has of late years fallen into disrepute, for the reason that in this class there are many pretenders. The competent engineer is satisfied to be considered a mining engineer, leaving the title "expert" to those who profess more than they know and whose claim to being expert is often based on deception.



## CONCENTRATES.

FREE GOLD is insoluble in ferric salts in the absence of other oxidizing agents.

THE new Mexican import duty on dynamite went into effect on the 1st inst. It is \$210 a ton.

SMELTING of ores is as much a process of concentration as that of treating ores on vanners or jigs.

TO OPERATE crushing rolls to secure the best results requires a knowledge of the business gained by experience.

THE quicksilver contained in the tailings from pan mills usually exists, in part, at least, as calomel and is difficult to save.

GOLD frequently occurs in limestone and there are many authenticated instances. Several such occurrences are known in South Dakota and California.

A CHANGE in the grade of amalgamated plates in front of stamp batteries, from a steeper to a flatter grade, toward the lower end of the plate, is said to give satisfactory results in amalgamating fine gold.

THE velocity of flow of solution through a series of cyanide precipitating boxes may be changed by making some of the compartments longer than others. It is customary to make all compartments of the same size.

ALL PATENTS, agricultural as well as mineral, are supposed to contain the reservation of the right of lodes or veins, having their apex without the patented area, to follow the dip of the vein or lode beneath such patents.

SILVER was first discovered in the Calico district of San Bernardino county, Cal., by Loughry Silver, a prospector, who went into the Calico hills in 1881 from the Grapevine district, 12 miles west of Calico, and who discovered silver ore in Wall Street canyon.

PROSPECTORS' RULES which teach that a particular kind of metal or its ore should be sought only in a certain kind of rock are misleading in their tendency. The prospector must learn to avoid all such fallacious ideas and search carefully everywhere, overlooking nothing.

THE height of timber line varies in different localities. In Colorado it is in the vicinity of 11,000 feet. It is slightly higher in California, presumably due to climatic conditions. In Peru, South America, the timber line is little, if any, higher than in the United States, notwithstanding it is in the torrid zone.

THE occurrence of fluorite is not positive evidence of the presence of tellurides of gold or silver or tellurium in any form in an ore. Fluorite occurs abundantly in lead mines and elsewhere where no tellurium is known to exist. Fluorite is of common occurrence in the Cripple Creek district, Colo., and with the telluride ores of the Black Hills of South Dakota.

VANADINITE is vanadate of lead, and is composed of vanadium pentoxide and lead chloride. It contains about 19% vanadium pentoxide. This is variable with the vanadinite ores of Colorado, New Mexico and Arizona. Vanadium pentoxide is said to be worth \$1 per pound. Good specimens are probably more valuable for cabinet specimens than for any other purpose.

IN smelting it is desirable to have the blast even as to pressure and temperature and as dry as possible. Considerable variations in either of these factors give variable results in the running of the furnace. The hot blast has effected great economy in the operation of iron blast furnaces. It is estimated that every 100° of heat added to the temperature of the blast is the equivalent of 3% of the carbon burned at the tuyeres.

THE capacity of a stamp battery can be greatly increased by crushing through a rather coarse screen—12 or 16 mesh—and passing the pulp produced over an impact 30-mesh screen, the oversize being returned to the battery for finer crushing. This keeps a considerable amount of the material in circulation for a short time, but it will increase the capacity of stamps under given ordinary conditions from 50% to 100%.

MINOR CHILDREN born in the United States are citizens and may locate mining claims, and may participate in the location of claims to the same extent as adult citizens. Neither age nor sex is considered in defining who is a citizen, for the term includes men, women and children. If the minors are too young to act for themselves, others may make the location for them in their interest, but their names once having been placed on the notice they cannot be deprived of their rights in the property.

THERE are numerous places in the high mountains of Colorado where all mining supplies and provisions, and everything to be used in mining and to support life during winter, are taken to the mines the latter part of sum-

mer, and the men are imprisoned, as it were, after the first snow falls until the following spring. In some of these high mountain camps the rocks are frozen to a depth of several hundred feet, and at some of them the ground is thawed by burning cordwood against the face before blasting.

IT is difficult to give quotations on tungsten minerals. In 1902 there were produced in the United States 221 long tons of tungsten ores (principally wolframite), valued at \$38,600. In the same year 82,000 pounds of tungsten were produced (presumably from the ore referred to), worth \$50,000, or about 60 cents per pound. Scheelite is an ore of tungsten. Its principal use is in the manufacture of certain grades of steel. The market can easily be overstocked by too heavy a production, as the demand for this and similar minerals is limited.

THE cost of any particular mining operation cannot always easily be predetermined, owing to the possibility of unforeseen changes in the ground to be passed through. Hard rock unexpectedly becomes soft, and vice versa. One portion may require timbering, another may not need it. The damage from blasting in some cases is unavoidably heavy, and the uncertainty which surrounds mining mechanics generally makes close estimates impossible. Contractors base their judgment on the average conditions under similar circumstances.

THE trials of the millman are often due not so much to his lack of ability and experience as to the disregard of the owners (individuals or company) to the requirements of the case. They argue that they have built and thoroughly equipped the mill with what they are assured was modern machinery. This may be true, but at the same time the machinery may not be suited to the ore; yet of this the millman cannot convince them. There are others, fortunately, who have the business sense to appreciate the disadvantages of improper machinery, and are willing to make the necessary changes.

THE report of the "California Debris Commissioner" may be obtained by addressing that official, W. W. Waggoner, Nevada City, Cal. The "Geology of the Perry Basin, Southeastern Maine"—Professional Paper No. 35 of the United States Geological Survey—together with other bulletins and professional papers, may be obtained by applying to the Director of the United States Geological Survey, Washington, D. C. Bulletin No. 35 of the California State Mining Bureau may be obtained by addressing the State Mineralogist of California, L. E. Aubury, San Francisco, Cal. No cost. Postage 2 cents.

ANGLESITE is lead sulphate. It occurs sparingly with other lead ores, and is the result of oxidation of lead sulphide (galena). Its most common occurrence is as a light gray ash-colored soft mineral of noticeably high specific gravity. It often shows a peculiar tracing of right angled lines, the remains of the cubic crystallization of the galena. The masses of ore often contain unaltered galena. Anglesite also occurs white, or tinged with yellow, green or blue, due to oxides of other metals. Minium is native red lead (lead oxide). It is of comparatively rare occurrence in large quantity, but is found in a few places in small amounts. Specimens were found in the oxidized zone at Leadville, Colo.

WHAT is known as the Bruckner cylinder is a type of rotary roasting furnace resting horizontally on rollers, and revolving between a fire box at one end and a flue leading to a dust chamber and stack at the other. The furnace is provided with manholes for the reception and discharge of ore charges. The cylinder is caused to revolve slowly, the smaller ones by means of friction rollers and the larger ones by gears, which engage a spur gear encircling the cylinder. The fire box is either stationary or movable. With the movable fire box one box may serve two or more furnaces in one battery. By this arrangement a fire box, after thoroughly igniting the sulphur in a charge in one furnace, may be moved along to the next, and this fired in turn. Later, when necessary, the fire box may be again brought in front of any particular furnace. In the Bruckner furnace ore may be treated in charges of several tons, and the roasting continued as long as desired, as it is not arranged to make a continuous discharge like the White-Howell furnace. At the Anaconda works there are 252 Bruckner cylinders. The furnaces may be run at any desired speed.

WHERE a mining location was made Jan. 1, 1903, and some party, unknown to the locator, performed work on the claim in March, 1904, this work, performed by the trespasser, cannot be claimed by the actual proprietor of the claim. Assessment work must be done by the owner or at his instance. Work done by a trespasser, even though paid for afterward by the owner, cannot be credited to assessment work. (Little Gunnell M. Co. v. Kimber, 1 Morr. Min. Rep. 536; Neshitt v. De Lamar's Nevada G. M. Co., 24 Nev. 273.) If the claim has not already been relocated by another for failure to comply with the law, the original locator may begin assessment work for 1905 and having done \$100 worth, may hold the claim until Jan. 1, 1907, when, if he has done no more work, it again becomes subject to relocation. There is no need to relocate, for the law does not permit a claim holder to profit by his own negligence (failure to do the

necessary assessment work) and thus hold the claim. The original locator's claim holds good without work until some other party intervenes, when, if the first locator has failed to comply with the law, his title to the claim is lost. In the case of a claim located Jan. 1, 1903, and pocket hunters did the necessary work by permission of the owners, in both 1903 and 1904, this work would stand for assessment on the claim on which it was done, but not for both claims, unless the claims adjoined and it could be clearly shown that both claims were benefited by the work done on one.

TUNNEL RIGHT CLAIMS usually encounter many legal difficulties if taken up in mineral districts in which there have previously been made numerous locations. A tunnel right which is the first to claim the lodes along its line is not altogether free from the possibility of lawsuits. The section of the Revised Statutes which defines tunnel site locations is as follows: "Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession of all veins or lodes within 3000 feet of the face (meaning mouth or portal) of such tunnel on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered on the surface; and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid; but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins on the line of such tunnel." By the words "the line thereof," as used in the above section, the United States Land Office decided that it referred to the full width of the tunnel, and no more. A lode discovered in the tunnel, not previously known, entitles the discoverer to 1500 feet on the vein or lode so discovered, and he may take the entire 1500 feet on one side or the other, as he pleases, or he may take a portion of the 1500 feet on one side and the remainder of it on the other.

ORE deposits, though for the most part of relatively recent age, as compared with the earlier geological formations of the earth's crust, occur in rocks of all ages from Archean to Tertiary and even recent, though the age of the ore deposit itself may be much later than the rock in which it occurs. Thus ore deposits of undoubted Tertiary age are found in Archean and Cambrian rocks. The gold-bearing ore shoots of the Homestake in the Black Hills of South Dakota are found in Archean rocks, and are also, in part, of Archean age, though supposed to have been enriched by the intrusion of igneous rocks about the close of the Cretaceous. The copper deposits of the United Verde mine at Jerome, Arizona, are in Archean rocks, but the age of the ore deposit is speculative. The lead-silver deposits of Leadville occur in limestone of Carboniferous age, but the ore deposits were formed long after the deposit of the formation. The gold mines of the California gold belt are mostly in Jurassic rocks (Mariposa beds), but those of the East Lode are in much older rocks, known as the Calaveras formation (Paleozoic). The formation of the ore bodies occurred not earlier probably than the close of the Cretaceous. Many of the most important ore bodies of the West are as late as Tertiary and occur in Tertiary rocks. Age is no indication of value or volume of ore bodies. There are comparatively few ore bodies of an age contemporaneous with the rocks in which they occur, though such do exist. Such, for instance, are some bodies of limonite iron ore; the borax deposit (colemanite) at Borate, Cal.; certain auriferous conglomerates, etc.

ALTHOUGH canvas plants are of great service under ordinary conditions, by the proper arrangement of hydraulic classifiers and mechanical concentrators the canvas table may be rendered almost useless. The object of the canvas table is to collect the slimes escaping the various types of concentrating machines, but the fact that at least one experienced concentrator man has successfully cleaned slimes from canvas tables on mechanical concentrators demonstrates that these finely divided sulphides may be saved on machines if the proper methods be employed in classifying the pulp before sending it to the machines. This is due to the fact that both coarse and fine particles of sulphide cannot be saved on a single machine without first, in some measure, effecting a segregation of the particles to be treated into material of approximately equal size but differing specific gravity. In this regard classifying must not be confused with sizing. Classifying is accomplished by means of pointed boxes, cones, etc., and the principle of the operation is based upon the unequal tendency of particles of variable size and having different specific gravities, to settle unequally in a medium—the heavier particles settling more quickly than the lighter. This enables the operator to draw off at the upper part of the box the lighter particles, the coarser and heavier being discharged at the bottom. The process may be carried still further by also employing sizing screens, which effect a separation of the grains into those of approximately equal size but of varying gravity. The process may be carried to any desired extent by a series of cone-shaped settlers, as has been demonstrated by F. W. Sherman at Park City, Utah, a description of whose plant and its operation appeared in the issue of the MINING AND SCIENTIFIC PRESS of March 26, 1904.



## The Goldfield District, Nevada.\*

Written for the MINING AND SCIENTIFIC PRESS by M. D. DRAPER.

As many persons have confused, or generalized the new mining camp of Goldfield, Nev., with the new discoveries—the new gold fields of southwestern Nevada—it will be well to differentiate these at the outset of this article.

The Goldfield district proper, of which the town of Goldfield is the commercial center, consists of a known ore-bearing area of about 10 miles long by about 5 miles wide. To those who are familiar with the Cripple Creek district in Colorado, it may be said that the Goldfield district is somewhat similar, the smaller towns, such as Columbia, Jumbo and Diamondfield, occupying positions something like the towns of Victor, Anaconda, Independence and Altman in the Cripple Creek district.

Goldfield lies about 30 miles south of the now well-known mining camp, Tonopah, which is the present terminus of the railroad. Contracts are now being let for grading for the continuance of the road into Goldfield in the spring.

The engravings accompanying this article both on this page and on the front page are from "Greater Nevada," by courtesy of the Reno Chamber of Commerce.

The discoveries of the district seem to have marked the beginning of a series of the most extraordinary finds farther south that have been made in mining in many years, and the deserts of southern Nevada, so long silent and deserted, are now receiving a thorough investigation in every nook and cranny.

Goldfield, proper, continues to expand with new discoveries, and a production which has already been phenomenal promises to be still further greatly increased.

We are accustomed to hear in the ordinary new camp of large assays and rich ore; but we are much less accustomed to seeing returns from thousands of tons of marketed ore which averages \$300 per ton for the entire output, though this is the case in Goldfield.

The inception of the district began with discoveries of ore in the spring of 1903. After an interval of spasmodic prospecting, followed by some little definite development, the January mine began to ship in 1904, followed later by the Combination, and still later by the Jumbo and the Florence.

The four mines named decided the future of the district, as they continued to ship quantities of very high-grade ore, thereby attracting the attention of capital. This money has been put to such good use that at present Goldfield may be said to have at least fifteen shipping mines, the most prominent of these being the January, Jumbo, Florence, Combination, Sandstorm, Kendall, Quartzite, Tonopah Club, Black Butte, Lone Star, St. Ives, Velvet and Cimarron.

Besides those named, there are probably thirty other mines containing quantities of ore running less than \$50 per ton; but few, if any, of the mines ship any grade less than \$200 per ton, as the hauling and freight is necessarily high at present. Hauling, freight, treatment and incidentals bring up the total cost to figure between \$35 and \$50 per ton.

To all practical intent and purpose the camp is one year old. During the year 1904 the total production was about \$2,750,000, or an average grade of ore of \$300 per ton.

Like all new camps, Goldfield has its disadvantages, chief among which is the high cost of supplies, owing to heavy freight charges. The following brief summary will give some idea as to present conditions in Goldfield:

Approximate population of Goldfield (town), 7000; approximate population of the district, 10,000; location, in rolling hills or somewhat rocky ridges, bordering sandy deserts in southwestern Nevada, 31 miles south of Tonopah and about 45 miles from the California line; altitude, 5600 feet; climate, very mild, with occasional snow flurries in winter, hot in summer with cool nights; telegraph and telephone lines to outside points; automobile and stage lines between Tonopah and Goldfield; four banks in operation; electric light plant running; six to eight custom mills building; water in the district, and power being brought in from Bishop, Cal.; water for domestic purposes abundant and pure; water for milling purposes at present scarce, but being rapidly developed; population living in tents or adobe houses; numerous frame buildings in the course of erection; numbers of restaurants, lodging houses, saloons, groceries and hardware stores.

Transportation into Goldfield is as follows:

From Reno, S. P. R. Tonopah, about 250 miles, fare, \$17.50; stage fare Tonopah-Goldfield, 30 miles, 50 pounds baggage, \$4; automobile fare

Tonopah-Goldfield, 30 miles, 20 pounds baggage, \$6; all excess baggage, 2 cents per pound.

Most of the mines have gasoline hoists, though there are some steam hoists, using wood for fuel. Groceries and other general commodities are about 30% higher than outside points. Camp wages are \$4 for eight hours' work.

**GEOLOGY.**—A period of great volcanic activity, during which a number of successive flows of andesite and rhyolite from various vents occurred, was followed by fissuring of these rocks and the subsequent deposition in and around these open fissures of immense quantities of silica. In fact, in almost every part of the district the original porphyries now contain more silica than at first. Naturally, there has been great metamorphism. Former normal andesites are now silicified andesitic breccias, and both they and the rhyolites, especially along the lines of fissuring, are often changed for hundreds of feet to what, for lack of a better term, may be called quartzite, inasmuch as the rock, both in composition and texture, resembles quartzite. It will be understood that in the strict sense of the term this rock is not quartzite, and that the name is employed here only for distinguishing purposes. The deposition of this silica was no doubt accompanied by small amounts of the ordinary ore-bearing materials, such as pyrite (but with no appreciable amounts of the precious metals), as almost any of the dikes will show its occurrence very finely distributed throughout the rock.

Following these phenomena was another period of dynamic movement, causing a second fracturing and fissuring of both the country rock and the quartzite, for we find the quartzite throughout the district shattered, brecciated and re cemented, which with all the accompanying conditions indicate that at this time the secondary fissures were filled with ore. That this really was a secondary fracturing is proven by the fact that

In the central part of the district it is common to find large areas of greatly altered porphyries, an indiscriminate mixture of kaolin, iron oxide, talc and gypsum, being the results of alteration and decomposition. In such areas more than ordinarily well defined, and separated streaks of the vein constituents, indicate the one-time existence of well defined walls. This condition prevails over considerable distances and actual walls are sometimes met with. There are also ore deposits of value in these greatly decomposed areas, but as yet none have been found of the extent or value of the deposits occurring in or near the quartzite dikes previously mentioned.

Still later than the phenomena mentioned a comparatively thin sheet of basalt, from near-by vents, spread over probably the whole district, but subsequent erosion has removed the greater part of it, its occurrence being now evidenced by an occasional lava-capped butte, within the area, or by the mesas, similarly covered, at some distance away from the mineral bearing areas.

The occurrence of a very small area of sedimentary rock at one place in the district has led to much



Silver Bell No. 1, Goldfield, Nev.



Ray & O'Brien Mine, Goldfield, Nev.



Velvet Shaft, Goldfield, Nev.

the ore-bearing veins, as they are now, run in various directions through the massive quartzite dikes, as well as through less siliceous country rock.

As might have been supposed, however, the ore-bearing veins occur in close proximity to, if not within the actual body of, the original massive "quartzite dikes" often, in fact, in one contact or the other of the dike and country rock; the secondary fracturing occurring along lines of weakness determined, usually, by the course of the dikes.

There are a number of cases where ore has been found where the vein walls are well defined, but as a rule such is not the case, the ore occurring in more or less irregular bodies, usually along the same general strike, and sometimes with stringers of feeders leading from one to another.

It is altogether probable that this secondary fracturing has been caused by the uplifting of the underlying Archæan rock, as we find it in several places occurring in more or less rounded bosses, where it has lifted the later volcanic rocks in dome-shaped masses.

There are other occurrences of this rock as isolated islands in the general porphyry mass. For all practical purposes the rock may be called granite, though some engineers have preferred to further differentiate it, suggesting the term alaskite (aplite), owing to its relatively small amount of mica and other characteristics.

Rhyolites, andesites and hornblende-andesites occur in large bodies with no definite relation to each other—the rhyolites sometimes apparently shading imperceptibly into andesite. It is noteworthy here that there are no known deposits of ore occurring in the hornblende-andesites. The more acid of the andesites, however, often contain ore deposits, and generally have more or less well-defined phenocrysts of feldspar.

diverse opinion. On the Tonopah Club mine there is a deposit of what appears to be shale at least several hundred feet in length, which is all more or less gold bearing. It occurs at a contact between andesite and rhyolite (see illustration) on the one side, and a basic hornblende-andesite on the other. It varies in width from 3 to 20 feet, seeming to compose, together with gypsum, talc, brecciated porphyries and quartz, a contact vein of large width. In order to conform to a theory advanced by some, namely, that the quartzite dikes were due to the replacement and silicification, in situ, of limestone beds, it was suggested that similarly the gypsum here was due to a metamorphism of lime overlying the shale to calcium sulphate either by the medium of decomposing sulphides, or by solfataric waters.

That this theory is untenable is shown by the fact that the quartzite dikes occur everywhere throughout the district at places where it is impossible to conceive any previously existing sedimentary rocks, and it is my belief that the gypsum is merely another phase of deposition as vein material, as it, like the dikes, occurs everywhere throughout the district. The occurrence of calcite itself (cited similarly as a proof of the former presence of limestone) in small quantities may be similarly explained. The shale, however, being a true sedimentary rock is more difficult to account for. It is reasonable to believe that it is of minor and local occurrence, and is probably due to a lake shore deposit, or something similar, at a period contemporaneous with or intervening between the porphyry flows, and that it has nothing to do with the sedimentary rocks lying farther to the west, near the Montezuma district, which is the nearest occurrence of importance of the sedimentaries, and which lies several miles away.

Calcite, it is true, occurs occasionally, but always as vein filling, and is therefore probably due to sol-

\*See illustrations on front page.



fatatic action and not sedimentary deposit. With the one exception noted, therefore, it is considered that there is no sedimentary rock within the Goldfield district proper.

Taken as a whole, the ore bodies of the district may be said to be somewhat erratic. They occur in lenticular or irregular detached form, sometimes having stringers leading from one to another, more often without any connecting link. They nearly always occur along the same general strike and, taken as a whole, they may be considered almost as continuous, as much so as high-grade ore ordinarily occurs in a fissure vein. For the reason that we have the case of ore bodies without the ordinary vein walls they are considered more erratic than usual. Viewed in the commercial sense this feature is no more detrimental than any one of the ordinary disadvantages conditions that are found in any camp, namely, wet mines, running ground, etc. In comparison, the extraordinary grade of the ore will more than compensate for any such objectionable feature. The accompanying sketches illustrate the

tents not exceeding an average of 4%. The latter consists almost altogether of pyrite in a very finely divided condition. Minute amounts of gray copper occur sometimes, and occasionally tellurides. The occurrence of the latter element is mentioned by J. E. Spurr in an analysis made by the United States Geological Survey, and has been noted in the Quartzite mine. Fluorite and gypsum also occur in small amounts. The general direction of the veins is north and south; there are a number of veins running at angles with the main system, but they are usually of less importance. In the Diamondfield section, however, the main vein system runs in a more general east and west direction.

One of the most important characteristics of the district is the high grade of the ore. As before stated, a total of about \$3,000,000 has been marketed from the camp in the past year, at an average of about \$300 per ton. This tonnage has been taken out with extremely primitive facilities, and at every possible disadvantage in operation. In the extraction of this grade of ore some interesting and pic-

hoisted, and an art gallery would not be sufficient to accommodate the "picture" assays made on selected specimens.

In the development and extraction of the high-grade ore a considerable quantity of low-grade ore has been taken out or thrown on the dumps, and several mines that have not as yet shipped at all have opened up large bodies of ore running from \$12 to \$75 per ton, which will, of course, be treated later. Among the latter may be noted such mines as the Tonopah Club, Black Butte and Red Top.

Various milling plants for the treatment of the low-grade ore are either contemplated or in different stages of construction. Owing to the limited amount of oxidized ores and the fineness of the sulphides, the amalgamation or concentration of the ores will probably have to be supplemented by slime plants behind the concentrators or cyanidation of the tailings.

Though the country is pre-eminently a dry desert, development of water for milling purposes is going on at present and there will be little difficulty in obtaining any required amount. Fortunately the ground stands well in most of the mines, requiring little timbering. Lumber costs \$70 per 1000 feet. As it is, 6x6-inch timbers are used for stulls, and plank for lagging.

This district may be said to be covered with locations, but property owners are in most cases willing to lease undeveloped ground at royalties varying from 5% to 20%; in truth, the district has been developed by lessees, a number of leases having expired January 1, 1905.

It is said that the town of Goldfield is completely

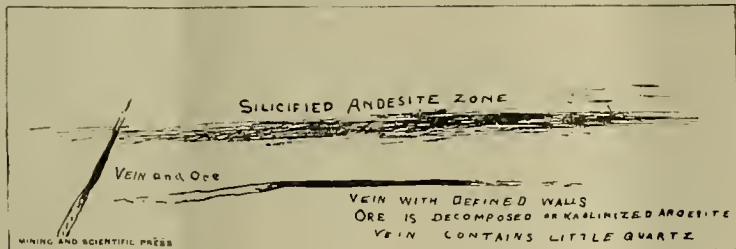


Fig. 1.

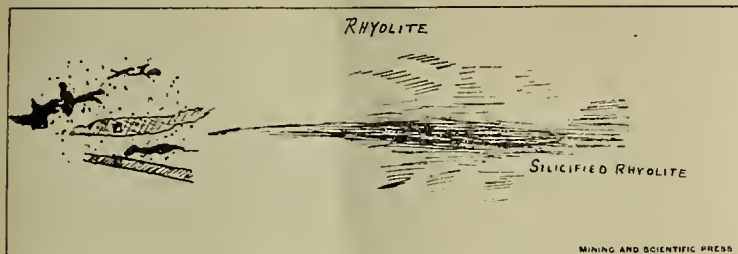


Fig. 2.

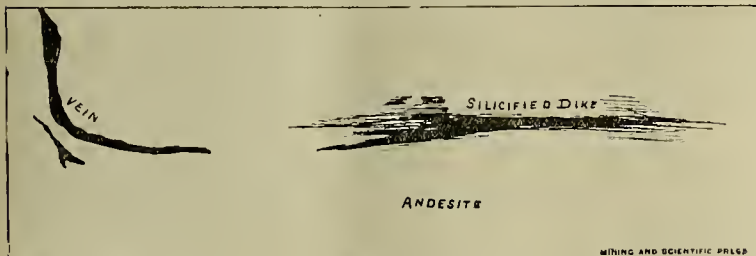


Fig. 3.

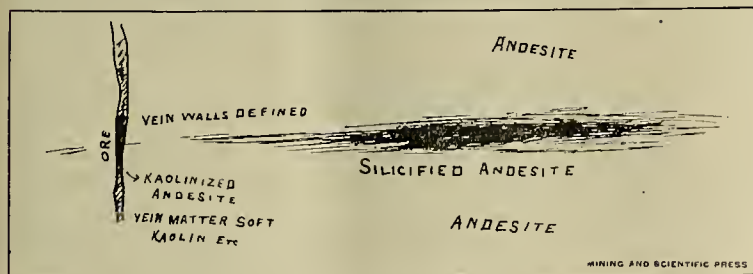


Fig. 4.

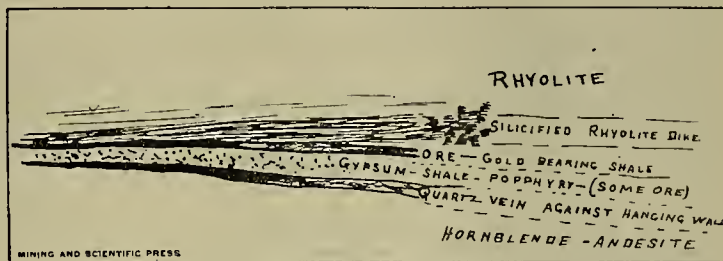


Fig. 5.



Fig. 6.



Fig. 7.

character of mineralization and vein formation in the Goldfield district.

The four main producing mines of the camp, the Jumbo, Combination, Florence and January, are all below the oxidized zone, the change from the oxidized to the sulphide ores occurring at a depth of about 150 feet. In every case the change does not materially affect the values of the ore, a most favorable feature for the camp. In the case of the Kendall and Sandstorm, sulphides were encountered on the surface. The former mine has a remarkable record, a total of \$100,000 having been produced from a 10-foot hole and one or two small surface trenches. The management of this mine has installed a steam hoisting plant and is beginning a crosscut for the vein from the 100-foot level.

The four mines above mentioned have all struck water in small amounts—a fact that is looked upon with favor because of the exceeding dryness of the country. The Combination shaft, at a depth of 350 feet, is the deepest in the camp.

Much of the ore of the district has the same character, usually highly siliceous, or with varying amounts of mineralized porphyry, the sulphide con-

ditions have been met with. On the Sandstorm and Kendall, for instance, the sagebrush is pulled up and thrown to one side and the soil swept up from the bedrock, screened, sacked and shipped, netting for soil, roots, quartz, etc., \$250 per ton; this is the nearest to shipping scenery that comes within my knowledge.

On the Jumbo, on one lease, as it was about to expire, men were taken from \$500 ore and put to work on a lower level extracting \$1000 ore. On another lease a miner drilling an "upper" had a small sample sack tied underneath the collar of the hole with which he saved the drillings for shipment, deriving from this source several dollars to the pound. On the Loftus-Davis lease, on the Sandstorm, ore was at one time sacked which was estimated to be worth between \$1 and \$2 per ounce; the fine gold could be seen running from the shovel point as the ore was being sacked.

On one of the Jumbo leases the owners were offered \$25,000 for a one-sixth interest in a lease when it had five months to run; the offer, it was stated, was promptly refused. Many instances are on record in the camp where ore worth \$1000 per sack was

equipped with the usual adjuncts of a mining camp. The promoter with glittering generalities is here, as is also the engineer of abstruse technicalities. The freak process man with a 110% extraction process has located already, and the curious sightseer travels side by side with the conservative investor. Fraction hunters vie with lot jumpers in activity, and the burro and the automobile travel the same road.

More important than all the foregoing is the fact that ore in large quantities, and of a very high grade, exists or has been shipped from many different places, and that the character of the ore and its amount assures a large and permanent camp in Goldfield.

Much of the inside territory has been incorporated into the holdings of various companies, and likely much of this will be developed later by lessees. For the present, it may be said that, viewed from previous developments, the production during the present year will be very large. New discoveries are of frequent occurrence, and the whole area has been prospected, but in a desultory manner, and to all intents it may be said to have been barely scratched.

Goldfield is not at present a favorable location for



the working miner. Many companies are in the first stages of incorporation, or are raising money, and the working mines have so little development that, considering the population of the district (about 8000), the number of actual working miners is small. Later, say in a year from now, the miner's opportunities will improve.

On the other hand, the country is probably one of the best in the United States for the practical and experienced prospector. By this, I do not mean the territory immediately surrounding Goldfield, but in the vicinity of the new discoveries recently made farther south.

Following the discovery of ore in Goldfield as prospectors gradually made their way into the surrounding country, it was found that practically all the area south of Goldfield was mineral bearing, and in the fall of 1904 very high-grade ore was discovered in what is now called Bullfrog district. This discovery resulted in a rush to the new locality and several other mines were opened up which presented an extremely favorable showing on the surface, ore showing free gold being broken from surface croppings, and assays showing low-grade ore—\$15 to \$20 per ton—across large widths, varying from 20 to 80 feet, and some as high as 200 feet. At least five mines in this locality, which is about 70 miles south of Goldfield, show high-grade ore, and a shipment from one of them ran about \$1700 per ton.

Later on another district—Kawich, about 75 miles east of Goldfield—was discovered, where high-grade ore was similarly found, and within the last three weeks high-grade ore was discovered at Lida, about 30 miles south.

Taken as a whole, the southern country is easily prospected, the topography consisting of sandy deserts, with low mountain ranges. The wash is seldom deep and the ledges, which are large, usually outcrop. Water is scarce.

In the Goldfield district present charges on ore—for hauling, freight and treatment—amount to about \$35 per ton, though with the advent of the railroad these charges will probably be reduced somewhat. Charges on ore from the other districts named will, of course, be higher, but mills are already contemplated for the Bullfrog and other districts.

Recently some unfortunate and very sensational newspaper articles were published relative to sickness in Goldfield. These articles were sent out entirely without foundation and deserve no more than passing mention.

As a whole, no mining camp discovered in recent years in the United States has equaled Goldfield. It is difficult to predict the future, but with the present knowledge, which shows the ore bodies to maintain their values with increased depth, and in the light of several recent discoveries, it seems safe to say that its production in 1905 will be between \$5,000,000 and \$10,000,000. Certainly we may be positive that it will be greater than in 1904, and this alone will prove Goldfield one of the highest order of the mining camps of the world.

Fig. 1 shows the character of ore deposit of most common occurrence—a zone of shearing and silicification, with independent veins in the vicinity of fissure type.

Fig. 2 shows the irregular form of deposits in the neighborhood of zones of fracture and shearing, and also to veins of definite boundaries, as on the left of the sketch. The dotted surface indicates soil which was screened and shipped, worth \$200 per ton. In the portions indicated by black, irregular-shaped ore bodies the quartz sometimes runs up to \$1000 per ton.

Fig. 3 indicates a less common ore occurrence at Goldfield. Here ore occurs independent of the dike, though in direct line with it and probably influenced by it.

Fig. 4 shows a defined vein crossing the strike of a sheared zone, with ore at the intersection. The portions of the vein at some distance from the intersection consists of soft kaolinized feldspar and other vein materials.

Fig. 5 shows ore occurrence at the Tonopah Club mine, Goldfield, Nev., at contact of rhyolite and hornblende andesite.

Fig. 6 represents a typical ore occurrence in Goldfield district and shows several zones of crushing and silicification and the formation of high-grade ore shoots in the silicified zone.

Fig. 7 presents a vertical cross-section at Goldfield, Nev., showing contact vein on the right, an irregular deposit in the center, and a defined fissure vein with good walls on the left of the sketch.

The heavy steam stamp has been effectively used in crushing millions of tons of ore before concentration during the past thirty years or more. Its most extensive application has been at the Lake Superior copper mines. More recently it has been employed in a similar capacity on the sulphide copper ores of Butte district, Mont. The capacity of these steam stamps has been increased from time to time from less than 100 tons per day to over 500 tons in twenty-four hours. Although this type of crushing machine has found great favor in the copper region, they are not in use, as far as known, in crushing gold ores prior to amalgamation.

## Relative Merits of Wet and Dry Crushing in Cyanidation.\*

By PAUL DANCKWARDT.

The question of stamps versus dry rolls would be a simple one if we had only one kind of ore in the Black Hills. But as this is not the condition here, and as, therefore, the character of the ore in each case is to be considered, the deciding point for the selection of the grinding process, the question resolves itself into that: What kind of machinery is the one that will give the best end result, or, in other words, or, by the use of which grinding process can we make the most money out of a given ore? Obviously it is just the same, whether the power required for the process is high or low, or whether the repairs are one way or the other, if the balance of all our accounts in any way of procedure is the most favorable one from the standpoint of the investor.

Of course, I will not say that the expense of grinding is a very unimportant function of the process employed, but that it is only a function, that it does not mean all of it or might be considered the deciding factor. Without going into details, I will endeavor to present an outline of the leading points which determine the selection of the proper kind of machinery to be used at a mill. But it may be stated that nothing is perfect and that everything, the machinery as well as the metallurgical processes, are continually in a stage of evolution, which state of affairs renders a correct answer extremely difficult. It is an easy task only for him whose creed never can be changed and to whom science is nothing but a rule of three.

The most important point is the degree of fineness required for a reasonable percentage of extraction. In this respect we find a great variety of ores in the Black Hills, of which the two extremes are represented by those of the Ragged Top district and some ores of Yellow creek on one side, and the Bald mountain ores on the other side. Between them are a good many ores, for which it is hard to fix correctly, in advance, which kind of machinery will be the best. For the first class of ores, those of Ragged Top and some of Yellow creek, rolls are without doubt rightly favored, for they require only a moderate degree of disintegration and generally no drying. No dust can cause any loss of values, or a high expense for oil and repairs, and the mills, therefore, can avail themselves of the advantage which rolls offer, that of cheap power. In reality in such a case the advantage which rolls offer is more apparent than actual, as anybody must agree to, if he considers that the grinding of the same amount of material to a finer mesh would actually call for a greater outlay of power and first cost of installation, which two factors form the proper basis of comparison, if otherwise the same conditions are prevalent.

The Bald Mountain ores, however, generally demand a high degree of fineness. In order to be able to perform this successfully by means of dry rolls it has been found necessary to dry the ores preparatory to the grinding, which not only causes extra expense for fuel, power, labor and repairs, but is also the cause of an appreciable amount of loss of values in the form of dust, and not at all must be disregarded the bad effect upon the health and efficiency of the workmen in attending and repairing machinery, a greater loss of time, and the more expensive way of charging the tanks. It has, however, one advantage, as justly stated by the inquirer, viz., that dust can be charged together with the coarse ores into the tanks, providing the ore does not require more than a certain degree of fineness. If, for instance, at the Golden Reward mill, the ore was ground finer than that delivered by an inclined screen of 6 mesh, No. 16 wire, we experienced not only a considerable falling off of the efficiency of the rolls, but also a lower extraction and an irregular leaching of the ore in the vats. The limits of this phenomenon will, of course, vary with the character of the rock, the percentage of fines, gauge, etc. Here, when such finer grinding is desirable on account of the character of the ore, is to be found the real weak point of the rolls. I believe to be right in making the statement, that then the rolls must be discarded altogether, as a subsequent separation of fines and coarse would mean an amalgamation of the weak points of both the dry and wet way, without having the advantages of any of the methods. Then we would, indeed, better start in the wet way right in the beginning. Whether this is done by means of stamps, wet rolls or Chilian mills, is a special question.

While I hope to have made clear where wet crushing is almost imperative, I will pursue the line of thought further by entering a subject still undecided here in the Hills—the question of very fine grinding. There are very strong advocates of such a plan for certain ores, and my own experience with a great variety of ores leads me to believe that they are justified in a good many cases, and that in this direction certainly more hope for improvement exists than in the idea of adding the roasting process to the present dry crushing process. This latter process would involve, if the success shall be only nearly general, likewise a preceding finer grinding which

would cause a loss in value during the following stage of roasting, that when added to the additional cost of both roasting and finer grinding would bar its introduction on a commercial scale. On the other hand, though a good many ores will show only slightly increased extraction by fine grinding alone they will with few exceptions yield enough additional value to pay for the extra expense, but for a great many ores, among them just the richer class, very fine grinding would offer the only means of profitable treatment by cyanide.

If we look at this as a fact, wet crushing would be the proper way of treatment generally and this would mean the necessity of installing wet grinding machinery (excepting special cases mentioned.) However, as I stated above, I would prefer Chilian mills to stamps, as they produce already a large amount of fines, and the regrinding in tube mills of the sands. Wet rolls, though they have the same advantage of cheap power as Chilian mills, are not so much to be recommended because they make a very uniform product and few slimes which are desired in our case. It may be granted that there exists a question of the proper treatment of slimes, which themselves are of a valuable nature, but this problem has lately been broached by a number of firms in and outside the Hills and will be solved, as the necessity exists. The American engineers have overcome greater obstacles than this before, and as long as the conditions promise to pay for the work and intelligence applied, nobody need entertain any doubt of the final outcome. This once obtained, the wet process would stand triumphant, while so far the two processes come out about even, as at present the mills using the wet process suffer a considerable loss in both dissolved gold and cyanide with the tailings when discharged.

In my opinion it is not so much a question of stamps or dry rolls, but that of wet or dry crushing and grinding based upon the character of the special ore to be handled, and that this is to be determined correctly before putting a plant up on the single point of cheap or inexpensive grinding machinery, and I have herein, therefore, treated the subject from this standpoint abstracting from all detailed costs, which mean nothing if not the possibilities of improved methods are expressed in figures likewise. This is not possible at present, but it may be stated that these possibilities of the metallurgical field are almost as great and wide as the Black Hills themselves.

## Smelter for Siliceous Sulphide Ores.

There are few questions in metallurgy and mining perhaps that have attracted more attention and to which more study and experiment have been given than that of smelting of sulphides, utilizing the fuel elements in the ores to smelt themselves.

Some extensive demonstration of this work is reported as having been done on the mines of the Lustre Mining Co., near El Oro, Mexico, in a smelter designed by John W. MacDonald of Pittsburgh and installed in 1901, which the Lustre Company state carried from the start all the cost of development, treatment, etc., and a surplus besides.

The MacDonald smelter for hot blast matte smelting is designed along new lines for heating the air for hot blast. The design is to utilize the waste heat from smelter to stack in raising the temperature of the air to 500° to 700°, and in a smelter of special design and proportions; also a different manner of handling the ore feed.

The company owns a patent on a converter of new design which has not yet been perfected, but which they say embodies the principles now used in converting matte, but which does the work in a small outfit located alongside the smelter, and which will take the molten matte direct from the forehearth to converter, that the smelter in operation, with converter attached, is designed to treat the raw sulphide ores from the mine direct to smelter without any preliminary treatment, and smelt to matte and convert to bullion in one continuous operation.

There are hundreds of mining companies with large bodies of siliceous sulphide ores which such a smelter would make valuable. The company manager states that he has several contracts under consideration, and that some of these smelters will be in operation as soon as its merit is fully recognized. The manager, C. W. Munson, Toledo, Ohio, would be pleased to give further information.

## Cyaniding Black Sand.

TO THE EDITOR:—I notice that in reply to a correspondent you say you see no reason why black sand should not be cyanided. Will you allow me to say that the gold in it can be cyanided, but owing to iron being dissolved, it cannot be precipitated upon zinc shavings, as the iron covers the Zn and prevents the displacement of Zn with Au. If you know of any one who can cyanide black sand I shall be pleased to show them where they can procure millions of tons of it, and in one place where I tried to cyanide it there are 280,000 tons containing \$4.50 per ton. This sand is cemented by action of sea water, but is quite porous and very easily broken up.

Salmo, B. C.

E. C. KINGSWELL.

\*Trans. Black Hills Min. Assn.



Method of Keeping "Stope Books" in the Butte District, Montana.\*

Written by C. E. MORRISON, C. E.

In mining, as in any business enterprise, systematized records are essential to safeguard against error, and in no part of the work are they more important than in that which deals with the actual extraction of mineral.

Such records might be divided into those referring to the geological features alone, and those which relate to the general characteristics of the ore bodies as to size, location, mode of development, timbering, etc. The latter might again be divided into, first, data relating to work done in the levels, and, second, data relating to work done in the stopes. The former would naturally be gathered through the surveys, which would vary according to the amount of information found to be necessary for the office estimates, and to the desires of the engineer. It would be preserved through composite level maps indicating the relation of one sill to another, and by single level maps which would show more in detail the development of each sill floor.

The manner of collecting this information depends on several factors, and it is the object of this article to outline the simple and complete system adopted in the Butte district. As is well known, the ore bodies there are of such size that square set timbers are used in all drifts and in the stopes above them. The problem confronting the engineer was to devise such a scheme, dependent upon the surveys and the system of timbering, that with not too much refinement an accurate record could be maintained showing all the details relating to the stopes. Formerly it was the custom, in combination with the surveys and timbering, to arrange the stope book with reference lines passing through the center of the shaft and perpendicular to the strike of the vein, it has been modified to such an extent that the data may now be collected with much greater ease and accuracy.

To demonstrate the relation existing between the surveys and stopes, it will be necessary to describe the former only in so far as they bear upon the latter.

Beginning at the shaft, the survey on every level is run out to the face of each crosscut and drift as the work advances, being brought up to date once a month. Along the drifts, which are timbered with square sets, the points of the traverse are established on the caps, and wherever consistent the line of sight is made the center line of the drift. The angles are read in the usual manner, being doubled to avoid error, the magnetic bearing being taken as a check, the elevation recorded and the horizontal distance measured. Notes and sketches (and this is very important) are made, showing the timbering angles, side sets, stations, manways and chutes with their numbers—in fact, every detail—so that it may be possible to plat in the office stope book an accurate plan map of the level with the timbers as they actually stand in the mine. Upon these notes and the map made from them, the rest of the work depends to a considerable degree. Such a set of notes is given below:

	Azimuth.	Bearing.	Distance.	Station	Co-ordinates.		Elevation.
					N.	E.	
2371	344°-0'	N. 16° W.			3275.5	4576.4	5276.1
2372					+ .54	+ 56.0	+ .75
(2373)	285-27 89-27	N. 89°-27' E.	56'.0	(2373)	3276.04	4632.4	5276.85
2371	344-0	N. 16-0 W.			3275.5	4576.4	5276.1
2372							
2371	105-37 209-37	S. 89-27 W.	35.0	(2371)	- .34	- 35.0	.40
2372					3275.16	4541.4	5276.50
2375	172-17 261-44	S. 81-44 W.	29.16	(2375)	-4.19	-28.86	.22
2376	201-33 283-17	N. 76-43' W.	23.60	(2376)	+5.42	-22.97	-.27
					3276.39	4489.57	5276.45

Assume that the co-ordinates of station 2372 (Fig. 1), are, N. 3275.5; E. 4576.4, and that the elevation is 5276.1, while the true bearing from station 2371 to station 2372 is N. 16° W. Upon this basis the following calculations, determining the co-ordinates and elevations of the successive stations, explain themselves. A traverse table is used to obtain the northings and eastings.

Between levels development work generally consists of raises or winzes run from one sill floor to another, while the stoping of ore on each successive floor proceeds from these. Most frequently raises on narrow, almost vertical veins, are run from level to level, two sets wide along the lead and from "foot" to "hanging"—one set for the chute and the other for the manway.

Raise 691 is shown in Fig. 3 in side elevation, and a plan of the sixth floor is given to indicate the position of the chute and manway.

From the plan of the sixth floor it can be seen that the chute is to the right and the manway to the left, and that each occupies a foot wall set, while the side elevation indicates that the raise offsets to the "foot" one set for each floor.

The field stope hook is about 10½ inches long by 4½

652 DRIFT EAST.							
Station.	H. I.	Angle Turned.	Mag. Bearing.	Floor Elev.	F. S. Elev.	Horizontal Dist.	Remarks.
2372 B. S. 2371	-2.35	285°-27' 210-54	N. 89° E.	-6.8	+3.10	56'.0 60'.0	To station 2373 W. face center last cap. To center of face of drift.
651 DRIFT WEST.							
2372 B. S. 2371	-2.35	105°-37' 210-54	S. 89° W.	-6.8	+2.75	35'.0	To station 2371 E. face center of cap.
2371 B. S. 2372	-1.73	172-17 314-34	S. 81° W.	-6.8	+1.45	29.16	To station 2375 E. face center of cap.
2375 B. S. 2374	-2.40	201-33 43-06	W. 77° W.	-6.75	+2.13	23.60 30.00	To station 2376 E. face center of cap. To center face of drift.

inches wide, with stiff leather covers to prevent crushing and to protect it from the drippings of the mine waters. As a means of reference, the back is labeled or stamped with the name of the mine, the vein or veins for which the book is a record and the numbers of the first and last pages. The body of the book consists of sheets of cross-section paper of some convenient scale, each sheet being divided into squares

summing a length of vein of 400 feet and allowing two floors to a page and a couple of pages to each level for a longitudinal section, cross-sections of raises, winzes and such other notes as are likely to need tabulation, the book is divided accordingly. Thus the first two double pages are reserved for the longitudinal section, etc., of level one, while page 3 will have the lower half reserved for the twelfth floor.

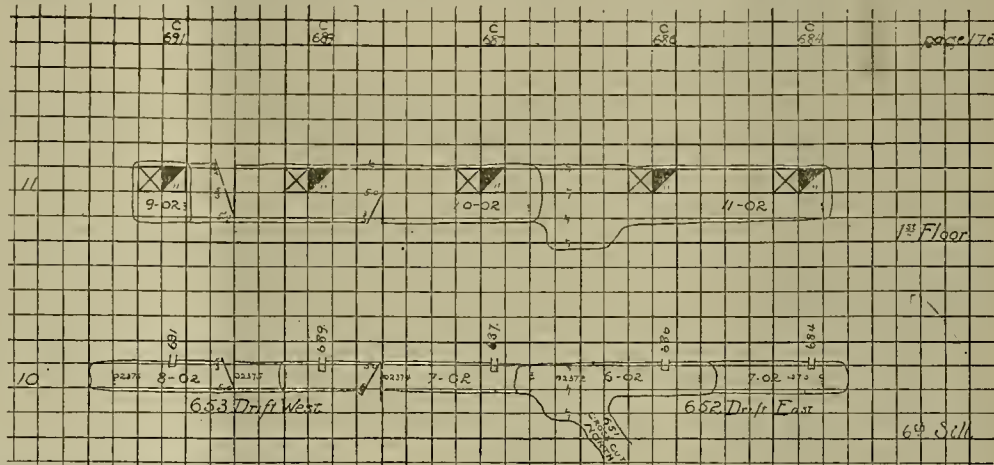


Fig. 1.

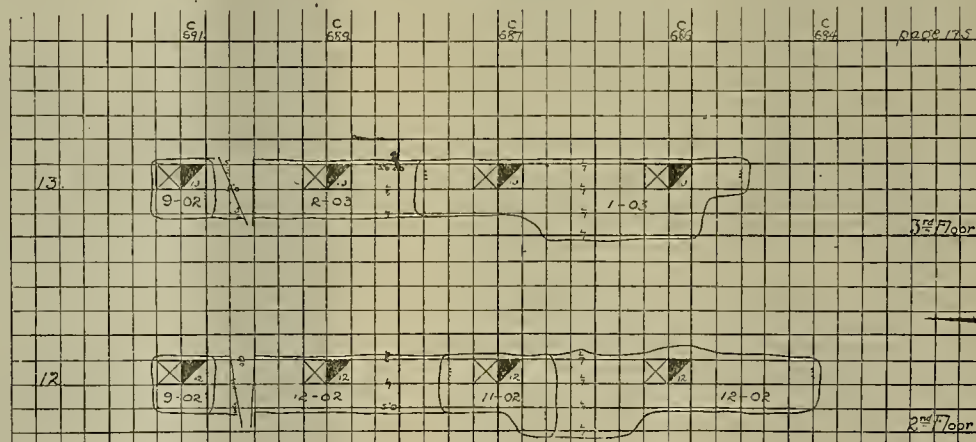


Fig. 2.

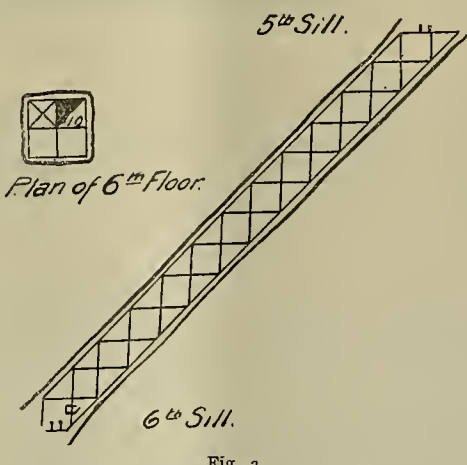


Fig. 3.

of 1 inch by lines drawn heavier than the others, and every double page being numbered consecutively. A scale of 20 feet to the inch has been found to give good results in this work, as it is large enough to permit of plenty of detail and not so large as to be cumbersome. Each square represents a square set, while a dot at the line intersection is used to indicate a post. With such a scale the book on being opened will represent on a double page, allowing for margins, about 400 feet in length of the vein, and will be wide enough, where the veins are narrow, to permit of two floors being platted on the same sheet, one above the other.

To facilitate the work when in the mine, the book is arranged in the office according to a system. As-

Page 4 will contain floors 11 and 10, and so on down till we get to the first level, which will be on the lower half of page 9, with the first floor above it. The right hand edge of each page is marked for reference with the number of the floor opposite. On the ninth floor, where the level is, not only is the page marked, but a small leather tag with the number of the level is attached to the leaf, so that it protrudes beyond the edge. With the hook closed, then, one can easily locate any level desired, after which it requires but the turning of a few pages to get the floor wanted. This is a great help in the mine when taking stopes, as it saves much time. In a similar manner reservation would be made on the following pages for the data relating to the second level, and the place for each floor would be indicated as in level one.

Where the vein is more than 400 feet long, this being the number of feet that can be platted on one double page, the book is divided into as many parts as there are 400-foot sections. If the length along the lead is between 400 and 800 feet, the hook will be divided into two equal parts. The first half will contain a record of one section 400 feet long, from the top floor of the first level, through as many levels as the number of pages will permit; while the second half will contain a similar record of the other section of the vein. This arrangement readily shows the relation of levels, raises, winzes, etc., in any one section.

From actual platting in the mine, from the survey notes and from any other sources, the sketch of the sill floor of each level is made in the field book for the work of "taking up stopes" underground. In the case of 652 drift east and 653 drift west, Fig. 1, the field stope hook platting would be identical with that in the survey hook as shown. Too much care cannot be given in the preparation and platting of the stope hook and too much detail can hardly be added, for any error in the sill floor will be carried up through

\* Abstract School of Mines Quarterly.



the stopes, while lack of data may necessitate future trips to the mine where the conditions may be changed. Where the drift timbering is regular, that is, where each set conforms to the standard drift set for the mine, it is a simple matter to sketch in the posts of a set by a dot at each corner of a square. But many conditions arise where regular sets may not be used, and as the stope timbers above agree with the drift timbers or depend upon them for their correct platting, it is essential to indicate, since we cannot actually plat, just where and how each irregularity occurs.

Assume for demonstration that the drift is a straight one, except for a small bend, and that this bend can be overcome by a swing of 2 or 3 inches in one set, all the other sets being regular. The proposition would then be to indicate in preparing the field stope book, the position of this angle or bend with regard to the chutes, manways, stations, etc., on the sill floor, so that in showing the same bend in the stopes above, we will be assured of having it directly over that on the level. This is most important, since in a measure the relative position of chutes and bends is the means by which we quickly determine in the mine the correctness of the platting of the timbers in the stope book. Other irregularities arise, but these would be handled in a manner entirely similar to that which we shall use in explaining the method of "taking stopes" above drifts 652 and 653. With the sill floor platted and the stope book prepared, we may enter the mine to collect the data which next follows in the record. This consists in the correct representations of all chutes and manways that have been run, on all floors, in such a manner that we shall know at a glance their true position with regard to the level and stope.

We will consider that raise 691 is the only one to have been begun before the stoping began, the others in the true sense being simply chutes and manways at the side and being run simultaneously with the stope. The side elevation of the raise shows that it offsets one set to the foot wall for every floor gained in elevation. We will assume that the chute and manway is in every case in the foot wall set as on floor six. If the drift set be given any arbitrary number, say 10, and for every offset to the foot we add one, then the chute and manway of 691 raise would be in row 11 on the first floor, in row 12 on the second, and so on up. The side elevation would give us a correct representation of the offsetting to the foot wall, but from it we could not determine the offsetting to the east or west along the lead, should there be any. The plan of each floor furnishes this. Usually the chute goes directly to the next level without offsetting east or west along the lead, and in such a case the chute and manway would be platted on each sheet the same distance from the edge of the page. If it offsets one to the east it is platted one set to the right of the chute below, if to the west one set to the left.

Figs. 1 and 2 show the timbering of the sixth sill, 652 drift east and 653 drift west and the stoping above. Examining the sill floor sketch we learn from it that the work at the head of 651 crosscut north was completed June, 1902 (6-02), that 652 drift east was finished in July, 1902, and that during July and August 652 drift west was brought to its present condition. It also shows that in the set where station 2372 is, the girts are 7' 0 center to center, that the rest of the timbering of the east drift is regular (5' 0 center to center of posts), that drift 653 has two bends in it, which way these bends turn and the position and number of the chutes.

Floor one shows that chute 691 is in the "foot," that the stope is two sets wide, one set being directly over the timbers in the drift, and the other to the "foot," the position of the bends and other chutes, and the date at which the work was prosecuted. The marks on the different caps are notches which are put in the timbers to indicate the timbering nearest to the face, and to help the surveyor taking stopes to locate himself when he next begins the work. The other floors show in a similar manner the details of the stope above.

Once a month this work is taken up by the surveyor, who in company with the shift boss visits all the stopes where ore has been mined.

The objects of the field stope book are many. It furnishes a permanent record of the work in the mine, shows the manner in which the development was prosecuted, the date at which it was done, and supplies the data for office maps and estimates of amount of ore extracted, cost of same, and the possible ore reserve. From it the office stope book, which represents each ore body in its true relative position, is posted once a month; and through the information which it supplies a longitudinal section is made every six months and semi-annual estimates of ore reserve are furnished. In short, it shows the shape, location and manner of development of any stope at any time.

### Platinum in Cariboo, B. C.

The gravel beds lying in the ancient river valleys from Quesnelle lake westward toward Fraser river range from 400 to 600 feet in thickness. The gravel is estimated at 500,000,000 cubic yards, and is thought to carry 15 cents gold per yard. The water system

consists of 33 miles of canals reaching to three mountain lakes that have been converted into reservoirs. The camp is equipped in all departments. Mining is done with six No. 8 gaults, apertures 6 to 10 inches, and values are collected in 3400 feet of partly riffled sluice. Undercurrents, for the recovery of flour quicksilver and the heavy metals which resist amalgamation, are being erected at the dump.

The presence of rare metals of the platinum group in the concentrate, remaining in the sluices after a clean-up, has been suspected for some years. A sample of this residue taken last September showed the following:

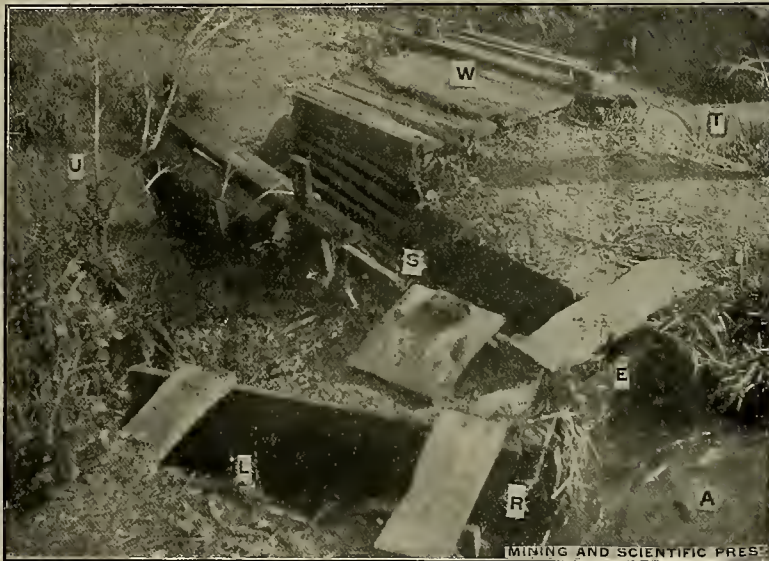
	Ounces.	Gross Value Per Ton.
Gold.....	95	\$1,900 00
Silver.....	180	90 00
Platinum.....	64	832 00
Palladium.....	61.4	1,759 00
Osmiridium.....	42	1,356 00
Copper.....	10.5	16 56
Total value.....		\$5,993 56

### To Keep Water Pipes Clear From Refuse.

TO THE EDITOR:—No doubt the numerous readers of your paper who use water under pressure have had trouble in keeping leaves, cones, bark, etc., out of their water pipes.

The following way has worked quite successfully and may be of value to others using water under similar conditions.

To keep a uniform pressure the pipe needs to be full. To make sure of this, an overflow is provided for. This overflow water (a small amount only is required) is utilized to carry off the trash. This is accomplished by placing a sloping screen from the bottom of the supply box to the overflow opening. The screen needs to be of smooth strips placed parallel, with spaces smaller than the smallest nozzle used. The top surface of the screen must be smooth and even, with as little grade as circumstances will permit. In



Device for Clearing Head Gates of Pipe Lines.

the accompanying illustration the screen S has 1½ inch grade to the foot, but would do better with less. One recently put in for a Siskiyou county, Cal., mill is made of ¼x4-inch flume battens placed edgewise, ½ inch apart, and 10 feet long, with 8 inches grade for the 10 feet. This works very nicely. One was put in a large ditch in Montana a few years ago made of pieces of track iron 12 feet long, taken from an old car track. They were placed edgewise ½ inch apart on a frame of 2x4 scantling. The ditch is 3 miles long, but the screen needs attention only once in twenty-four hours at the worst season of the year and frequently goes a month without attention. The illustration herewith of one put in about fifteen years ago for a small plant shows the general arrangement of the others also.

The ditch A supplies water through gate E for the pipe T, passing through the screen S to the head box W, the surplus passing over at U. Placing the waste way box R L against and parallel with the supply box E S, also 2 inches lower, works nicely, but it is harder to prevent seepage through into the pipe, in case of a shutdown, than when built as shown.

Sand is better kept out of the ditch, but can be drawn off through a gate under U by having the box R L lower than E S, and by shoveling out above E R, or by all three methods, as circumstances require. Without an overflow, the leaves, etc., soon pile up on the screen S. Wire screen does not work so good as long strips.

The overflow opening must be smooth and level transversely, and as long as the screen is wide. So far as the writer knows, there is no patent on this arrangement.

E. L. BALLOU.

Igo, Cal., Feb. 22.

### THE PROSPECTOR.

The rock specimens from South Fork of Salmon river, Siskiyou county, Cal., are determined as follows: No. 1, talc, showing extremely thin, leaf-like gold in a number of places. No. 2 is also talc and similar to No. 1, but apparently from nearer the surface. It also shows a little gold. No. 3 is also talc, but is stained by iron oxide. No gold visible. No. 5 is granular to schistose rock containing a large amount of calcium carbonate, and is probablyankerite, a combination of calcium, magnesium and iron carbonate, a very common rock in the gold regions of California. There are several localities where talc contains gold in California, notably in Amador, Tuolumne and Calaveras counties, in addition to this occurrence in Siskiyou county. These rocks are all the result of alteration of old intrusive rocks. No. 4 is quartz containing pyrite and a little copper sulphide, also free gold.

The rock sample from San Bernardino, Cal., marked S. A. J., is a sedimentary rock, probably a volcanic tuff. The pebble-like portion on one side accompanied by pyrite is probably fragments of the rock mass, which has been crushed and the angular edges removed by decomposition. These pebbles are rather harder than the light gray portion, and contain crystals of hornblende and feldspar, and suggest the probability of the rock from which they were derived having been andesite.

The rock samples from Oracle, Ariz., are: No. 1 is anamesite, a medium-grained basaltic rock, very similar to diabase. The bright crystals are iron sulphide (pyrite). No. 2 is evidently the result of the silicification of the same kind of rock. It contains abundant free quartz and some pyrite. If this rock is the foot wall of the vein it should be crosscut until a normal rock (one showing no quartz, something like

No. 1) is reached, for there may be more ore than that contained in the small vein. No. 3 is apparently from a different place. It consists chiefly of quartz, black mica (biotite) and light green epidote. The latter is probably the result of the alteration of hornblende.

The diamond-drill cores from Hadley, Alaska, Nos. 54, 118 and 206, are altered greenstone, probably diabase. No. 62 is largely composed of epidote, resulting from the alteration of pyroxene or hornblende in an original rock, possibly a diorite or granite. No. 141 is composed of epidote and chloritic mineral, a small amount of pyrite and considerable finely disseminated calcium carbonate, one of the products of alteration. No. 173 consists chiefly of epidote and pink orthoclase, with calcium carbonate. This piece suggests strongly the granitic origin of the rock. None of these rocks are typical, all being greatly altered and difficult to determine as to origin.

The rock specimen from Lucile, Idaho, is largely composed of feldspar, with a little quartz, and what appears to have been bornblende. It is too much altered to make identification positive, but it seems to be either diorite or a phase of grano-diorite. It also shows iron oxide, evidently the result of the alteration of pyrite. It may be gold bearing. A piece from greater depth would probably afford more satisfactory results.

The dark colored rock from the Whitlatch mine, near Helena, Mont., is a fine-grained, somewhat silicified granite, though from a casual inspection of a piece not having a fresh fracture across the grain one would scarcely think it to be granite. No. 2 is



aplite (largely quartz). This rock corresponds closely to J. E. Spurr's alaskite.

Those sending mineral samples for identification are requested to wrap them carefully and to always either write name on the wrapper, or place a card or other means of identification inside the package, as well as a letter explaining the occurrence of the specimen. There is now on the Prospector's desk a sample (two pieces) of dark colored mineral in quartz. They came in a square nitro cap box, but the name and address of sender is unknown. If the sender will send name and locality where this was found the determination will be published in The Prospector.

In the determinations of rock samples from Bodie, Cal., in the issue of Feb. 25 a mistake was made in the numbers. Nos. 1, 2, 3 and 4 were correctly given. No. 5, and not 7, is a fragment of rhyolite, decomposed by surface weathering. No. 6, and not 5, is the galena-bearing rock, and No. 7 is opal, there being no No. 8 in the lot.

The small mineral sample from Chloride, Ariz., is not scheelite, but quartz. The quartz crystals can be plainly seen with an ordinary magnifying glass, and these have the characteristic striations on the sides of the crystals and the pyramidal terminations.

The minerals from Manse, Nev., are: No. 1, kaolinized feldspar. It is probably an altered dike rock, or a portion of one altered to kaolin along the contact. No. 2 is hematite, an ore of iron.

The rock specimens from Holmes, Wyo., are: The dark colored, glistening mineral, specular iron, a variety of hematite, with quartz. The white rock, chalcedonic quartz. It may be sinter from springs carrying silica in solution, as in the Yellowstone Park in Wyoming.

The rock sample from Greenhorn, Or., is talc schist, colored by iron oxides. It may be gold-bearing.

The rock from St. Louis, Mo., is a very much altered dike rock, probably felsite. The bright yellow and red colors are due to iron oxide.

The tailings from Hughes creek, Fresno county, Cal., are evidently from a silicified hornblende schist, such as is frequently found in Madera and Fresno counties. The green material is hornblende and also grains of quartz filled with dust-like particles of hornblende.

The two samples from Poker Flat, Cal., are talc schist altered from dolomite or ankerite. Both samples contain pyrite and may possibly contain gold. This character of rock is abundant in the Mother Lode region of California.

The black sand tailings from Columbus, Neb., should be submitted to a cyanide expert for test. The Prospector does not make determinations of this sort. The sand consists chiefly of quartz grains, magnetic iron sand and particles of metallic iron.

The light blue crystal from Ibapah, Utah, is beryl, a silicate of alumina and glucina. It has a hardness of 7.5 and possesses all the ordinary physical properties ascribed to that mineral by Dana.

The mineral specimen from Cecilville, Cal., is a mixture of pyrrhotite, a magnetic mono-sulphide of iron and calcite, which appears in a group of rhombohedral crystals. The pyrrhotite may contain nickel, as this is not an uncommon occurrence in pyrrhotite.

The ore from Daggett, Cal., is bornite (copper sulphide). The rock from the same place, said to be the wall rock of the copper vein, is quartz porphyry.

# Gold Mining in Rhodesia.

NUMBER V—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by F. C. ROBERTS.

GOLD RETURNS.—At the present time all declarations of gold output are made in "bullion" ounces.

The mining ordinance in Rhodesia demands that all declarations shall be accompanied by affidavits covering the actual monthly "cleanup" made by individual companies as well as by private enterprise.

The same form is requested by the local Chamber of Mines; the latter organization publishes the returns.

Unfortunately the unit used in these declarations (the bullion ounce) may vary from 300 to 950 fine. It is obvious, therefore, that to attempt to calculate, for the purpose of comparison or otherwise, using the figures published, without being in possession of the figures referring to the fineness of the gold, is a waste of time. The elasticity attending such a method of dealing with gold is very great and could be utilized for purposes of much graver importance than appears at first sight. It would be far better to exclude the "troy" ounce altogether and substitute dollars and cents than to continue to use a method which offers so much room for abuse.

Surely the industry has reached a point where at least the fine gold unit can be adopted, so that comparisons and calculations may be made by persons other than those who are intimately associated with the working of the mine.

The monthly production of gold (bullion) in Rhodesia has reached 23,000 ounces. There are two or more mills of fair capacity under construction and a number of 5-stamp propositions talked of, which should contribute to the output during the next year. With these increases, and some intelligent arrangements made to ensure a constant supply of unskilled labor, the probabilities are that the 40,000-ounce mark will be reached within the next few years.

Continuing a consideration of the costs of mining, we have the following:

PUMPING STATION.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
White wages.....	\$ 1,151 95	\$ .0298	20.10
Native wages.....	61 34	.0016	1.02
Native food.....	40 77	.0010	.68
Stores.....	66 03	.0016	1.10
Fuel.....	2,956 37	.0770	51.44
Maintenance.....	25 21	.0008	.42
Workshops.....	645 43	.0166	11.22
Mill engine and boilers.....	723 01	.0188	12.68
Electric lighting.....	73 03	.0018	1.18
Compound.....	5 61	.0001	.09
Totals.....	\$ 5,744 44	\$ .15	

ELECTRIC LIGHTING.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 36 37	\$ .001	1.58
White wages.....	77 60	.002	3.16
Native wages.....	156 73	.004	6.32
Fuel.....	1,004 07	.0262	40.91
Maintenance.....	57 14	.0014	2.37
Workshops.....	590 13	.0154	21.09
Mill engine and boilers.....	527 57	.0138	21.54
Compound.....	6 54	.00018	.19
Totals.....	\$2,456 15	\$ .064	

STABLES.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 21 82	\$ .0004	2.82
White wages.....	8 84	.0002	1.13
Native wages.....	157 05	.004	18.00
Native food.....	61 08	.0016	7.94
Stores.....	501 08	.013	58.19
Maintenance.....	39 07	.0024	19.17
Transport.....	2 42	.00004	.28
Compound.....	15 03	.0004	1.70
Totals.....	\$866 39	\$ .022	

COMPOUND.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 1,406 50	\$ .0366	10.38
White wages.....	342 66	.0090	2.54
Native wages.....	1,896 51	.0494	14.00
Native food.....	6,812 00	.1778	50.30
Stores.....	222 44	.0058	1.65
Fuel.....	9 70	.0002	.07
Maintenance.....	947 61	.0246	6.98
Pumping station.....	111 51	.0028	.82
Electric lighting.....	228 28	.0044	1.25
Transport.....	375 16	.0098	2.70
Native hospital.....	855 87	.0152	4.33
Native labor supply.....	564 11	.0140	4.15
Pumping (mlae).....	104 27	.0028	.70
Totals.....	\$13,047 95	\$ .353	

TRANSPORT.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 80 02	\$ .0020	4.36
White wages.....	51 64	.0014	3.00
Native wages.....	644 15	.0168	36.24
Native food.....	301 16	.0078	10.90
Stores.....	536 28	.0140	30.24
Maintenance.....	73 05	.0018	4.09
Compound.....	92 63	.0024	5.18
Totals.....	\$1,778 03	\$ .0460	

NATIVE HOSPITAL.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$329 79	\$ .0086	16.10
White wages.....	1 51	.00004	.10
Native wages.....	294 02	.0076	14.24
Native food.....	140 59	.0036	6.87
Stores.....	1,247 07	.0324	61.14
Electric lighting.....	38 80	.0010	1.89
Totals.....	\$2,051 78	\$0.051	

NATIVE LABOR SUPPLY.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$150 35	\$ .0042	19.37
Native wages.....	418 37	.0108	53.75
Native food.....	197 20	.0050	25.62
Transport.....	9 70	.0002	1.25
Totals.....	\$775 62	\$ .0200	

MAINTENANCE.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 525 63	\$ .0136	2.91
White wages.....	5,346 14	.1520	32.20
Native wages.....	1,166 07	.0302	6.44
Native food.....	506 65	.0132	2.78
Stores.....	196 84	.0050	1.07
Workshops.....	8,780 63	.2282	48.43
Mill engine and boilers.....	83 66	.0022	.45
Hauling engine and boilers.....	43 15	.0012	.21
Electric lighting.....	34 55	.0008	.19
Compound.....	960 15	.0246	5.24
Totals.....	\$18,152 47	\$ .4710	

WORKSHOPS.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 1,860 93	\$ .0484	12.76
White wages.....	7,966 64	.2028	54.62
Native wages.....	1,530 80	.0362	9.05
Native food.....	584 19	.0152	6.10
Stores.....	891 22	.0232	4.84
Fuel.....	707 90	.0184	5.53
Maintenance.....	73 73	.0018	.45
Hauling engine and boilers.....	687 31	.0176	4.70
Electric lighting.....	177 16	.0046	1.33
Transport.....	70 36	.0018	.46
Pumping.....	165 56	.0044	1.13
Compound.....	29 56	.0008	.20
Totals.....	\$14,634 30	\$ .3750	

GENERAL CHARGES.			
	Total Cost.	Cost Per Ton.	Total Cost, %.
Salaries.....	\$ 7,247 65	\$ .1878	32.90
White wages.....	419 84	.0108	1.91
Native wages.....	2,287 29	.0564	10.38
Native food.....	1,156 05	.0300	5.24
Stores.....	1,441 19	.0374	6.53
Charcoal.....	30 24	.0007	.13
Fuel.....	49 81	.0012	.24
Sundry expenses.....	2,753 19	.0716	12.50
Maintenance.....	2,350 06	.0610	10.67
Workshops.....	221 05	.0056	1.01
Pumping station.....	420 15	.0112	1.95
Electric lighting.....	724 62	.0188	3.27
Transport.....	330 74	.0086	1.40
Native hospital.....	37 82	.0009	.17
Native labor supply account.....	471 17	.0122	2.13
Pumping.....	687 52	.0178	3.12
Compound.....	577 43	.0150	2.61
Stables.....	798 42	.0208	3.63
Assaying.....	9 70	.0004	.04
Surveying and sampling.....	13 57	.0004	.07
Totals.....	\$ 22,037 51	\$ .5720	



A Prospecting Camp in Rhodesia, S. A.



Reopening an Ancient Mine in Rhodesia, S. A.

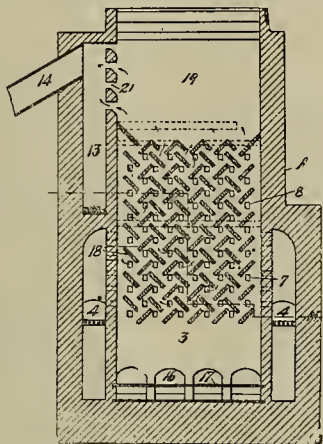


## Mining and Metallurgical Patents.

PATENTS ISSUED FEBRUARY 28, 1905.

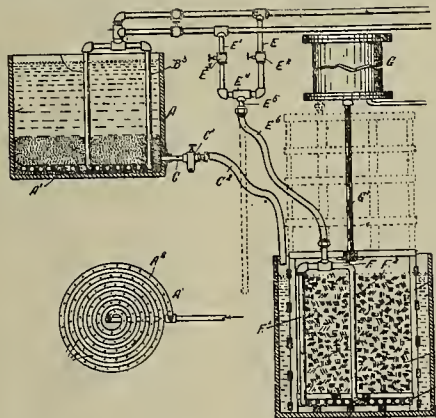
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ORE FURNACE.—No. 783,903; A. Skoog, Shreveport, La.



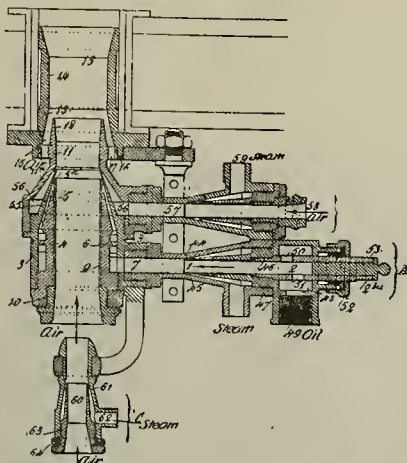
In quicksilver furnace, combination with plurality of vertically disposed alternately arranged fire and ore chambers, transverse partition in fire chambers, oppositely located fire boxes, one for each fire chamber, fire chambers having openings in their walls through which products of fires are delivered in opposite directions, tiling arranged in ore chambers in staggered formation whereby sinuous passage is provided for ore, tiling arranged to provide passages at extreme ends of chambers through which products of combustion will travel upwardly, means for feeding material to ore chambers, and means for discharging ore from chambers.

PROCESS OF EXTRACTING COPPER FROM ORES.—No. 783,600; G. H. Waterbury, Denver, Colo.



Process of extracting copper from ores, consisting first in placing suitable pulverized ore in tank containing solution of sulphurous and sulphuric acid, introducing air and steam to solution under suitable pressure, drawing off solution from leaching tank into precipitating tank containing metal sufficiently divided to allow solution to circulate therethrough, and finally introducing steam, or air combined with steam, to precipitating tank, whereby copper is caused to settle in tank.

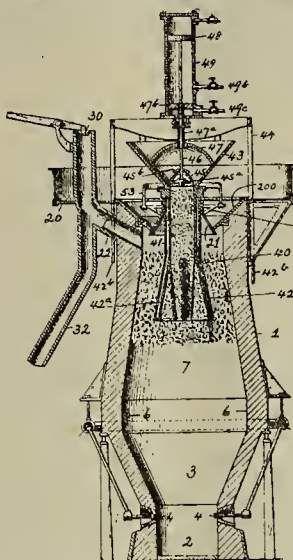
HEATING DEVICE FOR USE WITH LIQUID FUEL.—No. 783,898; A. R. Scherding, Paris, France.



Nozzle for mixing and ejecting liquid fuel, comprising means for forcing fuel in tubular stream, means

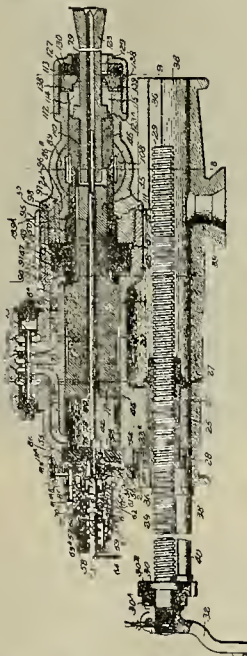
for mixing supporter of combustion under pressure with fuel, means for forcing mixture in tubular stream, means for supplying supporter of combustion to center of fuel stream and means for supplying tubular stream of supporter of combustion to outer wall of fuel stream.

PROCESS OF SMELTING ORES IN BLAST FURNACES.—No. 783,044; J. E. Johnson, Jr., Longdale, Va.



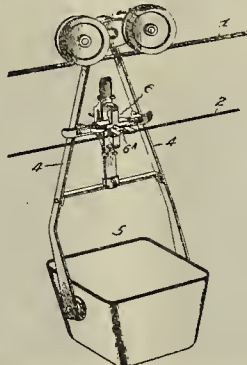
Process of smelting ores in blast furnace, feeding separate bodies of ore and fuel into furnace, smelting charge and increasing amount of heat available for smelting, and especially for those reactions which require high temperature, by supplying blast containing excess of oxygen, and utilizing heat in fuel by passing gases escaping from furnace through incoming body of ore and maintaining them out of contact with incoming fuel, waste gases thus being high in carbon monoxide and nitrogen.

ROCK DRILLING ENGINE.—No. 783,638; J. G. Leyner, Denver, Colo.



Fluid pressure drill, comprising cylinder, piston having longitudinal bore, hollow tool, water supply pipe extending into bore of piston, valve for pipe, and means whereby the pressure fluid opens valve when drill is in operation.

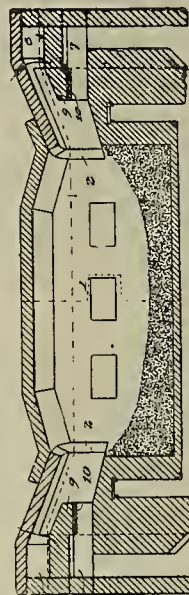
ROPE AND BUCKET CLIP FOR AUTOMATIC AERIAL WIRE ROPE TRAMWAYS.—No. 783,647; B. C. Riblet, Spokane, Wash.



In rope and bucket clip, clip bar, button on clip

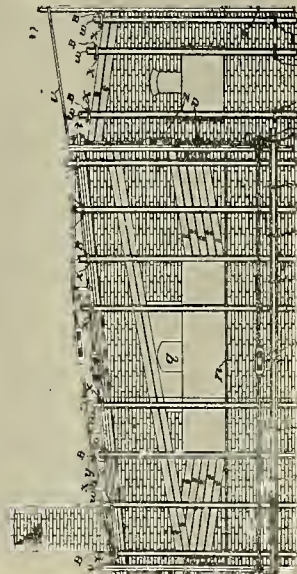
adapted to be connected to tramway bucket, yoke strap connected to clip bar, and adjustable means for securing traction rope to clip and yoke strap.

FURNACE ARCH.—No. 783,778; G. L. Davison and D. R. Mathias, Chicago, Ill.



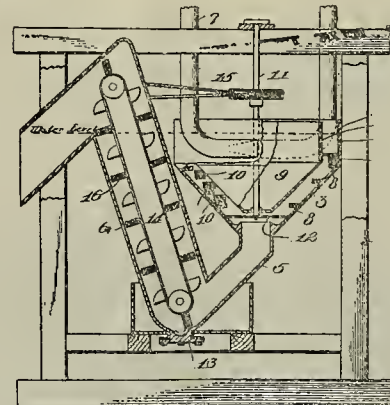
In open hearth furnace, combination with main chamber, of upper and lower flues leading into one end thereof and horizontally and transversely extending divisional arch separating upper and lower flues at or near point of entrance to main chamber.

SMELTING FURNACE.—No. 783,535; M. Murphy, Pueblo, Colo.



Smelting furnace having elliptical melting chamber, bottom of which is inverted elliptical arch having single row of bricks along each axis which do not break joint at point of intersection of rows, and having quarter sections filled in with bricks arranged in rows at right angles to each other, all rows in quarter sections and along axes extending into side walls of furnace.

ORE SEPARATOR.—No. 783,931; J. M. Couper, Atlanta, Ga.



Inverted conical vessel having outlet below top, means for introducing pulp into vessel tangentially thereof and above outlet, pipe leading from outlet, and delivery end of which is located at same level as that at which pulp is introduced into vessel, and means for catching gold associated with vessel.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The Pacific Coal & Oil Co. of London has given up the idea of striking paying oil in the region of Kayak island, on the southern border of Controller Bay, Gulf of Alaska. A dark brown—very viscous—petroleum has been found, but not in paying quantities. But in drilling for oil the coal prospects found warrant further development, which will be carried out. Manager A. H. Stracey of the Pacific Co. has left for London, but will return to push work. C. Cunningham will put a large force at work this season on a 40-foot vein that he has been prospecting for two years.

At Berners Bay the Gold King Co. is developing its properties under the direction of F. K. Muir of Portland, Or.

### ARIZONA.

#### Cochise County.

W. H. Pratt of San Francisco, Cal., has bonded and leased twenty-four claims near Paradise from Roe, Gill & Epply, and will start development work.—Manager Lewintownsky of the Savage mine, near Paradise, will sink the main shaft 500 feet before crosscutting.—At the Cochise Con. Co. work is progressing rapidly. They are rushing their three shafts and are making good headway in their adit to tap the zinc vein. They are arranging for machinery.—W. G. Rico of Houghton, Mich., has bought the Rieder group, near Paradise, and will start work on the property.—The Leadville mine, near Paradise, has been bought by A. Snedden and W. Cox of Tombstone, who will push development.

#### Gila County.

(Special Correspondence).—The Keystone copper group, 8 miles from Globe, has been sold by Findletter & Harvey to G. C. Campbell and others, of St. Louis, for \$300,000. J. C. Erman was active in aiding the sale and is manager for the new owners. The high-grade ore that the property has been shipping for eight years is about exhausted, but large bodies of medium and low grade siliceous copper carbonates are to be cyanided. A leaching plant is to be bought and put up immediately. Globe, March 6.

N. L. Amster of Boston, interested in the Arizona Commercial Copper Co. at Globe, and B. F. Close, superintendent of the Helvetia Copper Co., who will act as consulting engineer for the Arizona Commercial Copper Co., have made an inspection of the company's Copper Hill mine and laid plans for development and the purchase of new equipment, to include a hoist capable of sinking 1200 feet, air compressor, machine drills, etc. The company has purchased the 150 H. P. marine hoisters in the Rescue mill at Miami. These hoisters will be put in at the Copper Hill mine with the new hoist and the present equipment will be set up on the Black Hawk mine, where a new shaft is to be opened, miners having already begun to grade preparatory to sinking. It is probable that the surface track will be extended from the Gray mine, and Copper Hill ore trammed (using either horses or an electric motor) to the Old Dominion smelter. There are about 60,000 tons of 5% to 6% ore on the dumps at the Copper Hill mine.

#### Graham County.

After a shutdown on account of the recent floods, the reduction works of the Arizona C. Co. have resumed operations. As Chase creek has again broken out from the confines of its channel and endangered the plant, the company contemplate building a wall the full length of Clifton to keep the water in the channel. The wall will commence at the west end of Clifton, where Chase creek enters, and continue beyond the A. & N. M. station.

#### Maricopa County.

(Special Correspondence).—B. Ford has sold claims in the White Tank mountains to Eastern capitalists.—G. Hamlin, of the Relief mine, has sixteen men at work underground and more will be added soon.—J. E. Mad-dox will put men at work on his gold property, west of Phoenix.

Phoenix, March 7.

#### Mohave County.

In the San Francisco district the 10-stamp mill at the Blue Ridge mines will be started March 15. The mine is showing up well under recent development.

C. D. Pickering, superintendent of the Yucca Cyanide M. & M. Co. at Cedar, reports that he will sink 200 feet below the 400-foot level on the San Francisco mine. Owing to soft roads and inability to get oil to the mine, the mill has not been started up.—O. F. Kuencer of the German-American mines, near Vivian, reports that the mill is on the ground and that the work of assembling it will be commenced. Roads have been built to connect all the properties with the mill. From the Pioneer and 35th Parallel an even grade has been made on which track will be laid and the ore run to the mill in cars. The mill will be of 10 stamps capacity.

It is reported that C. G. Andrews and C. L. Doron of Los Angeles, Cal., will build a 500-ton smelter at McConico, 4 miles south of Kingman.—P. H. and A. H. Smith and M. A. Sawyer have located what appears to be a large deposit of wolframite on the east side of the Cerbat range, 8 miles north of Kingman. The ore occurs in dikes of feldspar.

#### Pinal County.

(Special Correspondence).—Owing to numerous washouts on the railroads, work at the various camps has been suspended for the present. Among the camps affected by the washouts are Troy and Superior.

Phoenix, March 7.

The Saddle Mountain M. Co. of Kelvin has placed an order for a 250-ton smelting plant, to be erected within a few months.

#### Yuma County.

H. L. McCarn, superintendent of the Planet Copper Co. at Planet via Yucca, reports that the company is opening up good ore bodies in the Planet mine. From the bottom of the shaft a drift has been run off on the contact and an ore body several hundred feet in length has been entered. This drift is now in 700 feet. It is proposed to sink another shaft to cut the contact below the head of the canyon and connect with the upper works. The ore opened up is rich in copper and other values. The company has twenty claims in the Harewan district on the Bill Williams fork of the Colorado river. The ore occurs as hedged veins and lenses.

### CALIFORNIA.

#### Amador County.

The leasers on the Defender at Defender have opened up a 9-foot ledge on the 200 drift and will start the mill.

#### Calaveras County.

C. Bennett and G. Knapp of Mokelumne Hill have struck good gravel on the Maloney property near China Gulch.—The owners of the Campo Seco copper mine are constructing a wagon bridge across the Mokelumne river, opposite the mine, to secure quartz rock for fluxing purposes, which is scarce within easy distance of the smelters on the Calaveras side, and plentiful on the Amador side.—The Stanislaus M. Co. has been formed to work the Duchess mines at Vallecito. W. E. Emery is secretary and manager at Vallecito. A vertical shaft has been sunk 75 feet, but the great amount of water encountered stopped this, and two tunnels have been run to open the vein, the lower one having been run 1824 feet. The property has a 10-stamp mill.

The Chris. Anderson mill is being run by the San Andreas Gold Channel M. Co. on rock from their gravel mine, near San Andreas. Electric lights have been placed in all the drifts and car runways of the mine.—The machinery of the San Andreas Blue Gravel M. Co. has been started. The work of sinking on the shaft will go ahead with an added force.—The Duryea mine at Central Hill, under the management of D. A. Nuner, is meeting with success in development work, and a large force will be put to work.—The new 10-stamp mill of the Benson mine has started at Altaville. A 70 H. P. hoist has been ordered.

E. C. Thwaite of Stockton reports that the 5-stamp mill of the Gertrude mine at Angels Camp is to be enlarged to twenty stamps.

#### El Dorado County.

Development work is being pushed on the Oliver quartz mine, near Greenwood, by Superintendent H. E. Laederich.—Superintendent C. F. McCracken is working the Summit Hill quartz mine in Spanish Dry Diggings, near Georgetown, with seven men.—The Short Handle quartz mine in Spanish Dry Diggings district is being unwatered by J. Federwitz, who has bonded the property of L. Sites and E. F. Lane.—The Union gravel mine, formerly the Delwisch, on Fort hill near Georgetown, is equipped with a pulverizing mill, which is operated by steam power. The mill is built to make twenty-four revolutions per minute and will work on an average 125 tons of gravel in twenty-four hours. The channel in this mine is several hundred feet in width and yields coarse gold. T. A. McCullough is the president and general manager, J. N. Isgrig superintendent and H. Ward foreman.—At the Clipper quartz mine, near Georgetown, H. G. Koppius is sinking several prospecting shafts.

#### Kern County.

Alexander Dallas of Bayonne, N. J., is in Bakersfield, projecting a new independent pipe line from Coalinga to Alviso, the head of navigation of San Francisco bay. He has rights of way for the entire distance of 134 miles between the two points, has the pipe purchased for the line and the money is ready for the construction. The company has contracted to purchase 10,000,000 barrels in the Coalinga field and it is said that a market has been found for the product. The pipe will be 8 inches and the capacity will be 10,000 barrels a day of the light Coalinga oil.

There are fourteen strings of tools running in the Kern River field, but no new territory is being exploited with the exception of the proposed deepening of one of the wells on the Grace lease. The deepening of this well will be for the purpose of settling the question as to whether or not there is still another lower sand in the Kern River field.

#### Mono County.

(Special Correspondence).—The Standard Con. M. Co. is dropping twenty stamps on ore from its several veins. Crushing is done in cyanide solution in the battery, the coarse, free gold being amalgamated on copper plates, and the vanner tailings are sent to a Moore slimes filter plant. Sizing is done by spitzkasten and the sands slimed in a tube mill. T. J. Hoover is superintendent of the Standard Con. M. Co. and E. H. Nutter is assistant superintendent.

Bodie, March 4.

#### Nevada County.

(Special Correspondence).—The Esperance Hydraulic Co. wishes to build a restraining dam at French Corral preparatory to working the auriferous gravels of the Esperance mine. T. McGuire of Grass Valley is making a topographic survey, estimating the drainage area, rainfall, etc., for a report to the Debris Commission.—A. Dahlberg of French Corral will resume work on the Slide mine on the South Yuba.

French Corral, March 7.

The Golden State M. & D. Co. has been formed to work the Noramhagua mine, owned by the Wm. Campbell estate and situated near Forest Springs.—F. J. Hellen of Pennsylvania is president, B. Goodwin of San Francisco vice-president, C. H. Barker of Grass Valley secretary, E. J. Rector of Nevada City treasurer, and A. Maltman of Nevada City manager.—A 2-drill air compressor is being installed at the Banner gravel mine at Canada Hill, near Nevada City. The Banner company is in good gravel and has been rigging up its washing plant during the past month, which is ready for operation.

#### Placer County.

At the Bellevue, near Ophir, P. S. Lozano and A. N.

Buchanan are hauling machinery from Blue ravine, near Folsom. They will put in an air compressor plant, machine drills, new hoist and straighten out the shaft. This mine has been paying under the management of P. S. Lazano.—C. A. Reed is working men at the St. Lawrence, near Ophir. He has crushed a lot of ore at Malmberg's mill with good results.—The 5-stamp mill recently built at the Bouk is running to its full capacity.—The Tadpole at Canada hill will build a mill with a capacity of sixty tons per day.

At the Star United mine, near Iowa Hill, the company have opened up the old tunnel and are running for the back channel. This is part of the Old Wolverine channel, which was a great producer in the early days. I. E. Rose is the superintendent.—The McGeachen mine has been bonded by a company, represented by I. E. Rose as manager, who have extended the tunnel and have struck gravel. They will commence breasting in a few days, as soon as they can get ground opened up.—It is reported that the pay channel has been encountered at the Prospect Hill (old Big Dipper) mine, south of Iowa hill.—Men are opening up the Lehanon tunnel, near the old Big Dipper mine, and the company expect to strike gravel in a short time.

#### Shasta County.

A 4-stamp quartz mill is to be built on Mule mountain, three-fourths of a mile from Centerville, by J. T. Jensen of San Francisco. E. Markwick has charge.

#### Sierra County.

A fine chimney of gold bearing quartz has been opened in the Empire mine in Gold valley, 14 miles north of Sierra City. A. N. Butts has charge at the mine.

#### Siskiyou County.

J. Derry & Co. have sold the Derry quartz mines on Klamath river, north side, opposite the Williams place at Anderson Grade Ferry, to Eastern capitalists for \$25,000. The company intends putting up a 10-stamp mill.

The Tyrer M. Co. has bought the mines owned by J. Hamilton at Oro Fino. Tyrer, the general manager, will sink shafts, run tunnels and put in a new 10-stamp mill, to be operated by electricity.

#### Sutter County.

The fine gold in the black sand on C. J. Kirk's land at Harkey's Corners is to be worked by a new process by Jos. Moore & Son.

#### Trinity County.

The Gold Dollar M. Co. has been formed by J. Elliott, W. C. Bissell, F. C. Meckel, S. M. Gibson and J. A. Wallace to work the Gold Dollar mine on Canyon creek, near Lowden ranch.—Work has begun on the lower tunnel at the Lappin mine at Deadwood. This tunnel will be run 900 feet. An upraise will then connect it with the upper levels and the body of ore opened up will be mined and milled. Owing to the expense and difficulty of handling the water in the upper levels, no work will be done until the tunnel is completed.

#### Tuolumne County.

Philips & Grundy will put a 5-stamp mill on their claim, between the Carlon ranch and Deer creek, near Groveland.—A. W. Bryant of Carters, superintendent of the Prudhomme mine, will treat the tailings by the cyanide process.—The Bluebell M. & M. Co. has its hoist and hoiler in place on the Hardtimes, near Arastaville, and gallows-frame completed and has begun sinking the shaft 100 feet below the present level, which is 60 feet. As soon as the Hardtimes is under headway the company will begin sinking the Bluebell shaft to a greater depth.

### COLORADO.

(Special Correspondence).—The litigation of 12 years between N. A. Munn and the Ithex Co. of Leadville has been decided in favor of Munn for \$266,000, amount due for his share in the property and for ore removed.—The suit of the Jerry Johnson G. M. Co. and the United Gold Mines Co. has been settled at Cripple Creek.—The District Court at Leadville has made permanent the injunction brought by the Leadville union miners against the operators to prevent the operators from using the card system. This system is being used in other camps throughout the State with effect against the Federation, but it seems that the operators will be obliged to try some other scheme in Leadville or be in contempt of court if they continue to use the card system. The card system was adopted in Leadville in the fall, and before it became permanent the court granted temporary injunction at the request of the Western Federation of Miners. It is claimed that the card system is having telling effect in the Cripple Creek district, and that no man is allowed to work in the district without a card from the operators' association.

Denver, March 7.

#### Boulder County.

The Wolf Tongue M. Co., operating at Nederland, shipped a carload of tungsten concentrates to Pittsburg, Pa. The concentrates are valued at \$450 per ton, and there were twenty tons in the consignment.

#### Clear Creek County.

The Grouse group of seven claims on the south slope of Bellevue mountain, at the head of Hoosac gulch, has been bonded and leased by J. W. Boyd of Idaho Springs for Buffalo and New York capitalists, and the work of cleaning out the workings has been started. A tunnel, in 700 feet, will be continued.—The breast of the Black Swan tunnel, on Chicago creek, has entered a good streak of milling ore 550 feet in from the portal. The property is owned by the Chicago Mountain M. & T. Co. H. R. Baker of Idaho Springs is the local manager.—Manager R. B. Morton has started the Jo Reynolds concentrating mill near Idaho Springs and is putting in a sampling plant.—W. W. Cannady and J. Cummings have resumed work on the Burns-Moore tunnel, which is in 1625 feet.—The Black M. Co. has started work on the Alpha mine in Gilson gulch. W. P. Black of Idaho Springs is manager.—C. Peer has charge of development work at the Wheatland mine on Trail creek.—Work has been resumed at the Josephine group on Chicago creek.

The McClelland tunnel is now in 3500 feet and is making from 7 to 8 feet per day in the heading. Since the



mishap of the big cave some months ago, by which progress was delayed and an immense amount of trouble engendered, there has been nothing to retard the work. That piece of difficult ground has been effectually caught up and timbered so that no more trouble may be feared from that source. The tunnel is now upon the last lap of its course to its primary objective point—the Freeland vein. From 1500 to 1700 feet more and that vein will be reached.

The Helen mine tunnel in Virginia canyon is still being driven ahead on the vein.

#### Custer County.

The Lone Star M. Co. of Pueblo has opened rich ore on Texas creek, near Silver Cliff.—The water has been reduced in the Toledo shaft and the track has been laid at the 250-foot level. Three shifts are at work.—The ore mined at the Silver Bar property, near Silver Cliff, is being run through the new experimental mill.

#### Eagle County.

The lease on the Spirit mine at Red Cliff has been taken by the Pittsburg Zinc M. Co. W. N. Buell has charge of the work.

#### Fremont County.

The Page mill, at Florence, has been destroyed by fire.

#### Gilpin County.

Gilpin county shipments for February amounted to 290 cars, or 6100 tons.—The Banzai M. Co. has sunk its shaft 210 feet on the After Supper, under the superintendence of A. Watters of Nevada. The company intends to sink 250 feet and then drift on both sides of the shaft. L. R. Tatum of Denver is president and manager.—Machinery has been put on the Hope & Parker shaft, in Phoenix district, to unwater the property for examination.—The Williams mine, in Lake gulch, is being worked under the direction of Eugene Drake.—Shipments of milling ores are being made from the 740-foot level of the Hawley-Gardner mine, on Quartz hill, being worked under the superintendence of J. Parks.—Operations are being carried on at the Alps in the 800 and 1300-foot workings, under the management of J. Williams. Upraises are being made to connect the 800 with the 600 and the 1300 with the 1200, and as soon as ground is opened up additional men will be put to work.—Harry, Tippet & Co. of Nevada are working the Forks mine, on Quartz hill, under a lease and bond. Work is being carried on between the 200 and 300-foot levels in sinking a winze and in upraising to open up the ground and to provide ventilation. Shipments of smelting ores are averaging about \$50 per ton, the last ore to the sampling works giving values of 22% lead, besides gold and silver values. The company is working with a whim, but may put in a small hoisting plant.—Mills & Crispin, leasing on the west 555-foot level of the East Notaway mine, in Russell district, have opened up smelting ores.—The Alice E. M. Co. has been formed by E. H. Campbell, D. D. Johnson and Arthur Ponsford to operate in the Phoenix district.—The Kemp-Calhoun mine, at the head of Leavenworth gulch, is being operated by Grenfell & Co. of Nevada. Their last shipment of first-class ores gave values of \$200 per ton, and their second-class ores gave values of \$100 per ton. The milling ores of this property, as a rule, are low grade. Work is being carried on in the 200, 250, 300 and 350-foot levels and the property has been opened up by sinking winzes and putting upraises between the levels.—Drennan & Co. are leasing in the 400-foot level of the San Juan mine, on Quartz hill.—Hauser & Co. are working in the 400-foot level of the Clark-Gardner mine, on Quartz hill.

#### Gunnison County.

At Ohio City six copper claims have been transferred from the locators—C. H. Mondell, F. Lockwood, W. Moines, A. Angman and F. M. Hudler—to R. W. Spensley & Co. for \$15,000. There is a 40-foot shaft and a 400-foot tunnel on the property. The new owners will begin taking out ore and develop the property. R. N. Spensley of Leadville has sold placer claims in Union Park, in the Tin Cup district, to A. Hartman and C. Stone for \$3000.

#### Hinsdale County.

The Golden Fleece mine and mill, near Lake City, are being put in shape for working by R. J. Kilvert.—It is reported that the St. Jacobs mine, at Carson, is to be opened up this spring under the superintendence of G. H. Zacharias.—The Czar, near Lake City, has been leased by L. A. Vinton and W. Swank.

#### Lake County.

(Special Correspondence).—An unusually rich gold strike is reported from the Ixeh mine on Breece hill, Leadville, which is being worked mainly by lessees.—The lessees on the Izard, on Little Ellen hill, northeast of the Ixeh, have carbonate carrying gold, silver and lead. The lease expires in a short time and the original owner of the claim, J. E. Izard, is in Leadville, and may work the property himself.—Fifty acres in Iowa gulch, in the southern end of the Leadville gold belt and including the Aurora No. 1, Aurora No. 2 and Cora May, have been leased from A. S. Sharp. There is a 525-foot tunnel starting on the Ready Cash claim and penetrating the Cora May and Aurora No. 1. The Denver people who have leased the property will begin development within the next twenty days.—A. V. Bohn is completing arrangements for the development of the Valley property in Evans gulch.

Leadville, March 7.  
On Bull hill, Echo canyon, in the Twin Lakes district, S. L. Dowell has started work on the Golden Fleece and Wabash properties, and the Last Chance Co. has started work on their shaft under the superintendence of S. Dodge.

#### San Miguel County.

The Tomboy M. Co. at Telluride is working 250 men in its mines and mill and is sending 300 tons daily to the new 60-stamp mill. The sinking of the Cincinnati three-compartment shaft, which is 300 feet deep, is to be continued. The shaft is designed as the bore from which the Argentine and Cincinnati vein will be developed. The vein will be prospected and developed in both directions from the shaft, and eventually it will be the main outlet through which the mines will be worked. The new mill is treating ore from the Tomboy mine

proper, a large portion of which is under lease to J. K. McCoy. During December the mill treated 9400 tons of ore, yielding a bullion value of \$38,000; 324 tons of concentrates were shipped, returning a value of \$23,500, the net profit over operating expenses and \$2400 expended for improvements being given at \$15,000.—Excepting the reduction in tonnage resulting from Wagner Bros.' cessation of work on the Smuggler-Union and Sheridan dumps, on account of freezing weather, operations on the Smuggler-Union mines are normal.—King & Lindsey, the Telluride Leasing Co. and smaller lessees are sending to Pandora about 400 tons of mineral daily. The new 60-stamp mill is taxed to its utmost capacity and most of the 80 stamps in the old mill are dropping constantly. The milling ore is concentrated on the basis of from five to eight tons into one, saving all the free gold values possible on the mill plates by amalgamation.—On the property of the Black Bear M. Co. in Savage basin drifts are being run on the vein in both directions from the bottom of the 150-foot shaft. It is the intention to build a mill the coming summer.

The Belle Champion mines in the Sawpit district, 17 miles below Telluride, have been sold by Anderson, Nulph & McDonald to an Eastern company represented by Mr. Grablin of Telluride for \$50,000.—A. M. Ballard will build a 30-ton custom mill in the Sawpit district.

#### San Juan County.

A. J. Aurand reports that two electric drills in the Bullion King crosscut at Silverton averaged 30 feet of holes each for every day in February.—The 3900-foot aerial tramway of the Old Hundred mine near Silverton has been completed and is running satisfactorily. The line runs at an angle of 45°.

#### Teller County.

The gold production from the Cripple Creek district for February, while necessarily lower on account of the short month, is up to the average. There have been no special features. The curtailed production from Stratton's Independence, due to the destruction of the ore bins by fire, is seen in the general figures. The leasing of the Stratton estate will not make itself felt during March, as it will take all of that month to get the lessees, with their new crews, in touch with the ground. The figures compiled in the camp are as follows:

	Tons.	Value.	Total.
U. S. R. & R. Co.	22,500	\$30	\$ 675,000
Portland	7,500	30	225,000
Dorcas	3,350	30	100,500
Economic	2,100	35	73,500
Wild Horse	2,000	6	12,000
King & Craig (Anaconda)	1,400	8	11,200
Other cyanide plants	800	6	4,800
Smelters	9,000	65	585,000
Totals	48,600		\$1,687,000

Kenzy and associates, who recently found a good vein carrying fair values in the shallow shaft on the Bob Lee on Tenderfoot hill, adjoining the Hoosier, near Cripple Creek, have completed a shaft house and will install a new and complete plant of machinery. The values are increasing as the work of development progresses. The vein was found in place at a depth of 12 feet.—R. Williamson, A. M. Keefer and L. Erickson who have secured a three years lease on the Oro claim belonging to the Colorado Springs M. Co., at 20% flat royalty, located on Ironclad hill, Cripple Creek, are now unwatering the shaft, which contains surface water. The shaft is down to 87 feet.

A rich strike has been made on the Mabel M. of the Gold Dollar property on the east slope of Beacon hill, Cripple Creek, by F. G. Worthington.—Machinery is being put on the Jerry Johnson property on Iron Clad hill by Blakeley and associates.

## IDAHO.

#### Blaine County.

The Wood River Zinc Co. has bought from W. D. Waters of Richmond, Va., the Nay Aug group at the head of Panther gulch, Deer Creek, and 2 miles from the mill that the Wood River Zinc Co. is building at its War Dance mines, near Hailey.

#### Boise County.

The South Lincoln mine, at Pearl, is being worked by Manager L. A. Wagner with sixteen men. The ores of this district consist of granular altered granitic gangue and quartz impregnated with pyrite, galena and sphalerite, the gold values ranging from \$5 to \$15 per ton, 25% to 30% being free milling.

The locators of the Oxbow placers, near Idaho City, plan to turn Payette river through a tunnel below Deadwood Fork and work the bed of the river, and utilize the water for power. If their plans are carried out, the water will have a fall of 48 feet at the mouth of the tunnel. A pipe line will carry it to Pine Flat 3 mile below, giving an additional fall of 62 feet. The tunnel will drain 2 miles of the river bed, and the pipe line will give 3 mile more of the river bed to be mined. The pipe will be 5 feet in diameter, of strips of wood 2x2, fastened with iron bands. The electrical machinery will be taken in next August. The tunnel, at first made 14 feet wide, 9 feet high on the sides and 12 feet in the center (it being arched), and afterward widened to 20 feet, as originally planned, is now being widened to 28 feet. The company expects to turn the water of Payette river through this tunnel May 1. Miners will then be put to work extracting gold from the bed of the river. Somewhere between 150 and 300 miners will be employed. The cost of the tunnel when completed will be about \$125,000. The estimated cost before the work was started was \$30,000, dimensions then to be 9 feet high and 20 feet wide. The extra cost was due in a great measure to hot springs that were tapped. Thirty tons of giant powder have been used to date in driving the tunnel. From 150 to 170 pounds have been used for each round of holes. The Idaho City World says the power that will be furnished during low water will be about 20,000 horse, and the electrical machinery will be of that capacity. The cost of the plant, together with freight, expense of installing, construction of pipe line, road, and other expenses to be incurred before the plant is ready to transfer power to Boise and vicinity and intervening points, will be about \$1,500,000.

G. Z. Edwards, superintendent of the Lincoln mine at Pearl, reports that the new three-compartment shaft is

200 feet deep and being retimbered with 10x10 timbers. The intention is to sink it 500 feet. It has been determined that the ore will cyanide well and a cyanide plant will be put in.

#### Idaho County.

The Diamond Chief M. Co. has bonded the Black Bear group of eleven claims, in the Big Creek district, near Warrens, to L. D. Lively of Omaha, Neb., representing Omaha, Neb., and Cleveland, O., capitalists. The Black Bear is a copper-gold property and has 500 feet of tunnel. A ledge 16 feet wide has given good assays. It is one of the older properties of the district, but has suffered because of lack of transportation and has never been worked on an extensive scale. The plans of the company include the erection of a smelter.

#### Kootenai County.

The Idaho Legislature has abolished Kootenai county and created the county of Clark from the southern half and the county of Lewis from the northern part.

#### Shoshone County.

It is reported that the Hercules M. Co. at Burke will build a 250-ton concentrating plant on Gorge gulch to work the reserves of milling ore.—J. E. Markwell of Wallace, manager of the Sister M. Co., says that engineers who have recently looked over the property report that in order to explore the ground thoroughly a shaft should be sunk to a depth of 400 or 500 feet; that the present tunnel cannot give sufficient depth. Estimates recently made place the expense of the necessary sinking and development at \$60,000. It will be necessary to install a compressor.

#### Washington County.

The Hancock Copper Mines Co. of Idaho has been formed by C. F. Drake, E. P. Rhea, G. A. Rahm of Weiser; J. Sennett and J. J. Curtis of Washington, D. C., to work ten claims on Camp creek, 2 miles above Landora. The ores are a gold-copper proposition and of excellent smelting qualities.

## MISSOURI.

#### Jasper County.

(Special Correspondence).—The mine of Scott & Co., on the Smith & Stickney lease, 3 miles north of Joplin, recently turned in 82,830 pounds of zinc concentrates. The owners of the mine are N. F. Stafford, Bert Davis, Gus Witsanski and W. H. Scott of Webb City, Mo. The company is planning to build a mill in the spring.—A new mill will be built at the Izanhart mine at Badger this spring.—J. G. Starr and G. C. Meese of Joplin, Valentine Boucher and R. F. Robertson of Galena, Kan., have secured a lease on eighty acres of the Hunt land, 7 miles northwest of Joplin. The company has put in pumps to drain the ground.—A new 100-ton mill is being built by Chapman & Co. on their lease at Webb City, Mo.—W. M. Scott and John Derby of Carterville, Mo., and C. W. Lake of Kansas City, Mo., have formed a company to work at Alba.—A mining company with E. B. Allen, Wm. Lotbain, L. F. Miller, H. Drew, J. McDonald, A. McDonald, N. B. Ristine and A. L. Mills of Joplin has been formed and has secured a lease on forty acres on the Amazon tract, north of Joplin. Fifteen drill holes are to be put down this spring.—Frank Nicholson of Joplin has let a contract for \$5000 worth of equipment to be installed at the Missouri Mule mine on the Providence lease at Webb City.—C. T. Orr of Joplin has sold to O. J. Raymond, W. A. Corl of Webb City and J. A. Bowman of Kansas City a forty-acre lease on the Missouri Zinc Fields land for \$8000. There are two good prospects on the land and two mills will shortly be built on them.  
Joplin, March 4.

## MONTANA.

#### Fergus County.

The Maginnis mine, near Maiden, owned by W. G. Conrad of Great Falls, is under the management of E. H. Crabtree. A 20-ton shipment averaging \$125 a ton has been sent to the East Helena smelter for treatment, this being the third shipment of the same kind since Mr. Crabtree took charge, and he says they will be made regularly hereafter until the company is prepared to treat the ore itself. More than 20,000 tons of big-grade free milling ore have been blocked out, and it is the intention to send the shaft, which is now down 140 feet, to a greater depth, and a hoisting plant will be installed as soon as possible. The old mill is being put in working order and will be started up.

#### Custer County.

The White Knob Copper Co.'s property has been recently worked by Receiver Clark with forty men. The main shaft is 700 feet deep, connecting with the 1500-foot Albert tunnel. The property is said to show a 23-foot vein carrying 3% to 9% copper and \$1.75 to \$3 gold and silver. The mine is connected with the smelter by a 10-mile electric railway, having a maximum gradient of 6% in a rise of 2000 feet. The smelter has three 200-ton furnaces and was blown in in September, 1902. The company was forced into the hands of receivers last October. It is stated that the trouble with the White Knob enterprise is that its expensive smelting plant and surface equipment were undertaken before the method of treating the ore was sufficiently worked out, as the bodies of carbonate and oxide ores have continued down 700 feet in that altered condition to the Albert tunnel level, and experience has shown that the ore lacked sufficient sulphur for a successful matting method of treatment with which it has been attempted to work it, and too much sulphur for making base bullion successfully. The sulphur and copper contents show increase in two short winzes that have been sunk from the Albert tunnel.

#### Lewis and Clarke County.

The Red Bird Co. of Helena, developing the Copper Hill claim, near Austin, has sunk 265 feet and has a 35-foot vein of copper and iron, which also carries values in gold and silver. A winze will be sunk 100 feet on the vein. The Red Bird Co. declared its usual monthly dividend for February.

A copper strike is reported at the Brooklyn Bridge mine, 5 miles south of Helena. The ore assays \$200 a ton in copper, in addition to gold values. A body of ore has been blocked out and shipment will be made. An



additional force of men is being put on. The ore is rich in copper glance.

#### Madison County.

The Mammoth M. & M. Co. is working the Leviathan and Mammoth mines under direction of A. C. Sanders of Mammoth. In July the company expects to increase its milling capacity, which is now ten stamps.—Chas. Estes has leased a small mill near Twin Bridges to work ore from his property in Nugget gulch.

#### Park County.

Superintendent F. Wartenweller of the Kimberly-Montana properties, at Jardine, reports that the company's stamp mill and cyanide plant are in operation. The company needs good miners who can run machine drills and a number of such can be given employment.

#### Powell County.

The dredger at Gold creek is in successful operation. The dredger has a capacity of 3000 cubic yards in twenty-four hours. Fourteen men are now employed. The company is figuring on putting in electric power next year, there being an unlimited supply of water in the neighborhood.

#### Silver Bow County.

(Special Correspondence).—On the Pennsylvania mine, at Butte, the three-compartment shaft is being sunk 200 feet deeper, taking it to the 1700-foot level.—The Montana Legislature passed no laws directly relating to mining interests or to the mining litigation of F. A. Heinze and the Amalgamated Copper Co.—The Leadville M. & S. Co. is preparing to open twelve claims 17 miles northeast of Butte.—The Mammoth M. & M. Co. has taken over the Leviathan and Mammoth mines, in the Mammoth district, and will increase the capacity of the 10-stamp mill.

Butte, March 6.

The Raven M. Co. has started sinking a shaft at Centerville under the superintendence of J. Berkin.

An air pipe line is being built from the Mountain Con., at Butte, to the Poulin shaft preparatory to exploring the copper silver belt by the Anaconda C. M. Co.—The Butte & Boston Co. has started work on the Berkley in the Meaderville district with twenty men. This is one of the rich mines of the Butte & Boston system, but little ore has been taken from it during the last few years on account of litigation, the company having been prevented from working it by an order of injunction. The shaft on it is 800 feet deep. The work will be confined to the repairing of the dilapidated parts. No ore will be mined at present.—The Rarus mine, of the United Copper Co., which was practically closed down January 30 on account of the flooding of the lower level, due to the breaking of a pump, has been started with 150 men. The breaking of the pump was followed by the breaking of the flat cable to which was attached a large tank for raising water, and the latter accident delayed the work of reducing the flood.—At the Reins property in Meaderville the water has all been taken from the workings and a new 800-gallon pump has been put in at the 800-foot level.—The Pittsburg & Montana C. Co. has placed electric pumps at the 700 and 1200-foot levels of shaft No. 2.

## NEVADA.

#### Emerald County.

High-grade ore has been found on the W. R. Hearst claim of the Hearst-Jagers G. M. Co. at Tule canyon, 33 miles southeast of Goldfield. The Hearst claim is one of a group recently purchased by G. Wingfield, W. J. Douglass and associates from T. Jagers, one of the pioneers of Tule canyon. A mill is to be built at the mine. The main shaft will be sunk 300 feet, from which level drifts will be extended and the ore shoot blocked out then.

#### Lincoln County.

The ores from the Abe Lincoln mine, at Pioche, are to be treated by concentration and cyanidation, as recommended by A. P. Donohue, who is at the mine. A cyanide plant will be ordered by Manager Scott.

Under the management of Mark Hopkins the purchasers of the Potosi group at Good Springs are installing the tramway to the railroad over which ores already mined and on the surface will be taken to the smelters.

Cunningham & Jewett of Marysville, Utah, are developing the Betsy group and M. Bryan of Los Angeles, Cal., is developing the Red Cloud at Good Springs.—The Keystone mine and mill at Good Springs have passed into the hands of a British syndicate for \$337,500. R. W. Rathbone is manager and expects to have the mill in commission before the end of the month.

A new camp known as Nelson has been established near the Techaticup, 10 miles west of Eldorado canyon. The camp is showing up bodies of high-grade ore, and is near the summit of Vegas mountains. In the Techaticup mine great ore bodies have been found and a hoisting plant is being installed and the mine worked in a systematic manner for the first time in its history.

#### Nye County.

To illustrate present freight conditions at Goldfield, it may be mentioned that a bakery there has been using an adobe oven. Recent rainstorms did considerable damage. The proprietors went to Reno, where they bought \$26 worth of brick, which was crated at a cost of \$30. They could not get the brick in by freight, so had it shipped to Goldfield as express at a cost of \$600. The Wells-Fargo Express Co. has notified Goldfield merchants that hereafter neither machinery nor brick will be shipped into Goldfield under any consideration. There were 2400 bricks in this shipment and the cost laid down in Goldfield was 30 cents per brick.

A Salt Lake man at Goldfield says: Following the custom in vogue during the early development of Tonopah, Goldfield and other camps, the leasing system has been adopted here and is apparently successful. There are 100 tents here, filled, pitched along what seems to be a main street. There are several saloons in the place, two general stores, one of which has quite a large stock of goods, several eating places and prospectors galore. Feed is high. Oats cost \$7 per 100 pounds, hay \$4 per hundred pounds and water \$5 per barrel. It looks as though most of the freight will come in here from California. Parties living in the valley below Hiko are haul-

ing hay and corn here for sale and that seems to be the cheapest point of supply. The country from Hiko to this place looks good for prospecting. Ground around here is staked off for 6 miles, in the valley as well as the hills.

#### Washoe County.

At the annual meeting of the Springfield-Nevada M. Co. at Springfield, Mass., P. A. Shorman, the treasurer, reported the company to be in a first-class financial condition, all bills being paid to date, with \$8000 in the treasury. Ira Miller, the president, gave a report of the development work during the year, a description of the new pipe line, which conveys water to the company's two mills and increases its water supply. Most of the pipe has been laid, and it is expected that the mills will resume operations at once. Officers were elected as follows: I. Miller, Westfield, N. Y., president; R. F. Monroe, vice-president; P. A. Shorman, West Springfield, Mass., secretary and treasurer. The company owns 1000 acres of mineral land at Olinghouse canyon. It has four mills in operation.

At Olinghouse the Springfield-Nevada M. Co. have forty men working on the Dondero and Williams claims and are working both their mills; J. W. Sheehan is working the Crown Point; R. Nonis is stoping ore in the Forlorn Hope; Harvey & Nichols are taking ore from the Oro; H. Grant of Truckee Meadows has leased the Renegade No. 2; E. Olinghouse has men at work at the Green Hill, and J. A. Ingalls is developing the Micaga group. In the White Horse district, Golden, Frazier & Wetmore of Wadsworth are working the Emma L., on the Addie C., W. Williams is putting a hoisting plant capable of sinking to 500 feet.

## NEW MEXICO.

#### Grant County.

Two hundred men are employed by the Burro Mountain Copper Co. at Camp Leopold in the Burro mountains. Improvements are under way which will increase the capacity of the plant from 150 to 200 tons daily. New machinery has been added to the 100-ton concentrator. A large reservoir is being built  $\frac{1}{2}$  mile down the canyon, below the concentrator, and a pump, with 200,000 gallons a day capacity, has been installed. It has been impossible to haul the concentrates to the Silver City smelter, owing to bad roads, but the mill has been running steadily. The plant has been averaging a shipment of twenty-five cars a month and with increased water supply the shipments will be increased.

#### Lincoln County.

The Wisconsin M. & S. Co. has been formed by C. L. Scheler, Madison, Wis.; E. H. Talbert, Jicarilla, N. M., with W. A. Melvers, Nogal, N. M., as manager to build a 50-ton custom, milling and concentrating plant, in the Jicarilla district. The Jicarilla district is 10 miles northeast of White Oaks and 7 miles southeast of Ancho on the El Paso & Northeastern Railway. The country, rock is an altered granite. This region has been worked chiefly by placer miners in the past. A belt of copper has been found to pass through both the east and west sides of the district. L. A. Fox is working a copper deposit.

#### Rio Arriba County.

The Pay Roll claim of the Keystone-Bromide M. Co., at the 250-foot level, shows a vein of sulphide copper ore 20 feet in width averaging \$30 per ton. The ore also carries gold. In the Gold Pan, the Danbury group, the Red Fissure and other claims the gold values exceed the copper, but they are valuable as copper properties. The Sixteen to One and the Hutchison claims carry greater values in silver than in copper. Copper is found on every claim, ranging in value from 2% to 20% of the ore.

#### Sierra County.

The placers at Shandon in the Caballo foothills, skirting the Rio Grande, have been dormant, the locators holding back, waiting for some one else to do something for them. A new town has been laid out on the Rio Grande above the mouth of Apache canyon. It is called Shandon. The gold that comes from Shandon is purer than any of the other placer gold of the southwest. The output from the Shandon gold field averaged \$1000 per month. The gold was mostly obtained by native miners who owned the richest surface ground and were the closest to bedrock. The gold was mostly obtained by the blowing process, the mouth serving as the blowpipe.

Parker Bros. of El Paso have several hundred acres of placers in Trujillo gulch and are putting up hydraulic machinery to ground sluice this gulch. A 6-inch pipe is being laid to the reservoir, 2 miles from the river. It is calculated that with the triplicate pump now being installed enough water can be thrown into the reservoir above the placer grounds every twenty-four hours to furnish abundance of water for an eight-hour run.

Goss Bros. of Salt Lake City, Utah, have a bond and lease on 640 acres of ground belonging to the Silvas. They will put in machinery to operate the placers on an extensive scale.

## OREGON.

#### Baker County.

W. H. Burchdorf has driven a 176-foot crosscut tunnel through soapstone at the Big Bonanza, 7 miles northwest of Sumpter, in the Bald Mountain district.

The Empire and Phil Sheridan mines, on Granite creek, near Granite, have been acquired by Wheeler & Co. of New York from C. S. Miller of Granite, who built the Monumental mill, the first in the district.

F. D. Smith of Sumpter has secured the Psyche and Diadem mines in the Greenhorn district and will develop them.—J. G. Kirchen of Sumpter has finished plans for a 100-ton mill to be put up at the Friday mine by the N. J. Sorensen Co.—G. Pearsons, owner of the Treasure Box and Yankee Girl claims, 2 miles east of Sumpter, reports that he has sunk a shaft 20 feet on the Treasure Box ledge. This has been crosscut and found to be 20 feet in width. Trouble is experienced with water, and operations will have to be discontinued until pumping facilities can be provided.

Placer properties of the Cow Creek G. M. Co., south of Baker City, are being fixed for the season's run and will soon begin operations. Five hundred feet of new flume has been put in and a more plentiful supply of water is

expected than was thought probable earlier in the season. Three giants will be worked.

#### Jackson County.

E. D. Briggs of Ashland has a bond on the Golden Wedge, on Galice creek, from Thein Bros. for \$15,000. Considerable development has been done and a 2-stamp prospecting mill is on the group. The new owners intend doing a large amount of work on the property immediately, and expect to erect a larger mill at an early date.

Shipments of from \$800 to \$2000 in dust and nuggets have been made regularly every week through the Jackson County Bank at Medford from the output of the Champlin dredger on Fooths creek. The dredger has made but a slight showing as yet on the vast acreage of ground it has available on Fooths creek, and will operate winter and summer, the water of Fooths creek being sufficiently high to float the machine by the system of wing dams placed below it. At present the dredger is closed down to change power from steam to electricity, the poles and wires having been strung from the power plant of the Condor Water & Power Co. at Gold Ray.

#### Josephine County.

The Bybee quartz mine on Rogue river, 5 miles below Galice, has been purchased from Savage Bros. by E. Cassidy of Bellingham, Wash. The old workings will be reopened.

Superintendent R. N. Bishop of the Greenback M. Co. and Martha M. Co. says the recent find at the Greenback was made on the 500, 700 and 900-foot levels, and at the point now reached by the drifts the ledge shows a width of 21 feet of ore carrying good values. At the Martha mine, no large ore body has been found. Development will be continued with a double shift, men and power drills until the ledge is fully explored.

The Royal group of Galice is being operated by J. R. Harvey. Two giants are working under a pressure of 510 feet. The bank has a height of about 100 feet and carries gold from the surface to the bedrock. Few boulders are met, but the ground is compact, necessitating the use of a strong pressure behind the giants. Considerable powder is also used to loosen the ground and facilitate working. The mine has been in operation for forty years, and as yet, in comparing the ground worked with that which remains, only a beginning has been made. Since the mine has been operating under the present management, it has been improved in its equipment. The ditches have been enlarged and the pipe renewed with strength sufficient to withstand the whole pressure of 500 feet.

The Michigan M. & M. Co. is developing properties on Applegate river, south of Grant's Pass. Buildings, shops, quarters and a mill are under construction. Power will be supplied by a 100 H. P. boiler and engine. Separators, vanners and a steam hoist, capable of developing the mine to a depth of 2000 feet, will be a part of the equipment. The work is done under the superintendence of W. T. Perry. The big Royal hydraulic mines of Galice are being worked with 2 giants under 510-foot pressure. J. Harvey is manager. The banks on the Rocky Gulch channel, where operations are under way on the Royal group this season, are 100 feet high and carry good values all the way down. Dumpage is over a sheer bank, 200 feet into Rogue river.

#### Lane County.

In the Bohemia district the Crystal Con. Co. is getting out timber for the mine and surface buildings. Manager F. D. Wheeler is at the mine.

## SOUTH DAKOTA.

#### Custer County.

The Gladiator Con. M. & M. Co. will build a mill on the Gold Fish mine, near Custer. J. B. Goode of St. Louis is interested.

#### Lawrence County.

On Deadwood gulch,  $\frac{1}{2}$  mile from Lead City, the Hidden Treasure Co. will continue its shaft from the 170 to the 500-foot level.

The Mining Review reports that everything has been shut down at the Clover Leaf mine at Roubaix, except the pumps, pending the completion of plans for a reorganization of the company and an increase of the capital stock. A special meeting of the stockholders of the company has been called for April 10th, at which time a vote will be taken on the proposition to increase the capital stock from \$1,200,000 to \$2,500,000. The par value of the shares will be reduced from \$100 to \$1 each. The company will proceed to double the capacity of its mill by the addition of sixty stamps, sink the shaft to the 1000-foot level, or 300 feet below the present lowest workings, complete the system of damming and transporting Elk creek around the property, and in other ways prepare for enlarging operations in all departments.

The Ohio-Beaver Creek M., M. & Dev. Co. is contemplating building a cyanide plant in the Nigger Hill district. T. C. Lentz of Columbus, Ohio, is president and treasurer; F. L. Stein, secretary; D. Clark of Tinton, general manager, and W. Watson of Tinton, superintendent.

The Rex G. M. Co. has re-elected the following officers: President, Dr. J. A. Steele of Minneapolis, Minn.; vice-president, M. B. Copeland of Omaha, Neb.; treasurer, J. J. Morrow, Lead, S. D.; secretary, A. C. Davis, Lead, S. D.; general manager, John Gilroy. The Rex company's property is 3 miles southwest of Lead City, on Whitewood creek. The principal work of development has been confined to a shaft near the center of the ground. This shaft has been sunk 145 feet and a crosscut driven 500 feet. There are two plans under consideration, namely, to crosscut 500 feet in a northerly direction, and to sink the shaft another 100 feet before doing further lateral exploration. The mine is equipped with a gasoline hoisting engine and air compressor, and pumps have been placed in the mine sufficient in power to handle all the water.

The Wasp No. 2 M. Co., working 2 miles south of Lead City on Yellow creek, reports that, in 1904, 42,042 tons of ore were crushed and treated. The average heads were \$3266; average tails, \$1.15; per cent extraction 67.8. During the year the company paid 16 cents



per share dividend, or \$23,664. The net profit for the year was \$32,189.81. The average cost of mining and milling, which includes all expenses of every kind, such as taxes, insurance, etc., was \$1.76.

The Golden Elk M. Co. will put in machinery to develop their property in the Nigger Hill district. F. E. Wharton of Lead is secretary.

#### Pennington County.

The Ivanhoe Co. at Keystone will resume sinking in its shaft, which is down 100 feet.—F. Groch is making a cyanide test on the ores of the Bismarck mine at Keystone.

The main shaft of the Antler mine is down 30 feet. The shaft is being sunk to a depth of 75 feet, where a drift will be run on the vein to explore the ore shoot at that depth. The mine is on the Burlington railway, 4 miles north of Hill City, and is owned by the Burlington Gold M. Co. H. L. Jones of Hill City is the manager.

A. Anderson is putting a steam hoisting and pumping plant on the Canton mine at Hill City. He intends to put a small test mill on the property.

### UTAH.

#### Juab County.

The shaft at the Victoria mine in North Tintic is down 175 feet and sinking will be continued to the 400-foot level. R. S. Robertson is superintendent.—The force at the McKinley property at Eureka is making rapid progress in the development of the mine. The tunnel is in 500 feet. A depth of over 300 feet has been attained and indications point to the close proximity of an ore body.—The Brooklyn property at Silver City has been producing some good ore, which carries silver, gold, lead and copper. Work is being carried on by a whim at a depth of 200 feet.—Work at the Black Jack mine has been suspended.—The dump at the Tesora mine is being worked by Chas. Boyd and Wm. Owens.

#### Salt Lake County.

The Boston Con. of Bingham, according to Manager M. M. Johnson, is shipping to the furnaces of the Bingham smelter an average of 150 tons of ore daily.

H. M. Adkinson, manager of the New England G. & C. Co.'s mines near Bingham, expects to start the mill about April 1, when water is available. Development is being carried on with machine drills in the mine. President D. W. Williams is expected to visit the mine.

Manager R. H. Channing, Jr., of the Utah Con. M. Co. at Bingham, has men at work on the proposed plant designed by F. Meyer for the abatement of the smoke nuisance. It is the intention to install a pumping plant and water will be obtained from the Jordan river. In connection with the power plant, additional boilers have been installed. About 10,000 gallons per minute of water will be required in the operation of the plant. After collecting the gases, the poison-laden waters will be conveyed away from the banks of the Jordan to a point where they will do no damage.

The aerial tramway system which the Continental Alta Mines & Smelters Co. has installed in the Little Cottonwood mining district at a cost of \$150,000, is nearly completed. The upper 2½ miles of the line, including the terminals, etc., is ready, while on the lower end men are stringing the buckets, tightening the ropes and putting on the finishing touches. It is to connect the company's mines at Alta with the mill on Tanner's Flat. It is equipped with what is stated to be the longest single steel wire rope ever strung along a line of tramway towers. This carrying rope is 10 miles long, and to it are attached the bucket conveyors. H. M. Crowther is manager.

The Tiawauke mines at Bingham have been bought by a company of which L. A. Jeffs of Salt Lake City is president. C. F. Mairs of New York is secretary and treasurer.—The Butler-Liberal at Bingham is to be equipped with a hoist, air compressor, boiler and other machinery by Manager A. L. Jacobs. The air compressor will be of 65 H. P. and will be located at the shaft. A 50 H. P. hoist has been ordered. Its lifting capacity will be 4000 pounds, and it will be equipped with cages.

A 100-ton concentrator is to be built on the West Jordan by G. K. Fischer to treat the second-class lead ore of the Jordan mines at Bingham.

#### Summit County.

At a recent annual meeting of the Daly-West M. Co. held in Denver, Colo., the financial report submitted showed a cash reserve on hand of \$284,148.45. The total receipts from all sources during the year was \$2,280,139.75, as against \$2,643,747.51 during 1903, a decrease of \$363,607.77. From the sale of ores and concentrates the company received during the year \$1,804,672.83. The concentrates and ore were both worth more per ton than they were in 1903, the better work of the mill resulting in concentrates worth \$4.10 per ton more, on the average, than they were during the year previous. Of the regular grade of crude ore 28,355 dry tons were shipped. It contained 1,023,821 pounds of copper, 11,335,964 pounds of lead, 1066.56 ounces gold and 1,578,924 ounces of silver, which sold for \$885,169.30. During the time the Quincy works were operated 14,440 tons of ore, carrying 450,452 pounds of copper, 4,547,258 pounds of lead, 693.33 ounces gold and 625,158 ounces of silver, were sold, for \$305,600.75. The concentrates produced amounted to 15,207 dry tons, containing 541,340 pounds of copper, 9,616,557 pounds of lead, 607.88 ounces gold and 848,652 ounces silver, which sold for \$605,738.65. A new product, known as mill crude, from the sorting belts introduced a few months ago, amounted to 267 tons. This ore carried 7382 pounds of copper, 151,665 pounds of lead, 9.59 ounces gold and 11,490 ounces silver, and sold for \$8,164.13, or \$30.58 per ton net. The concentrates brought \$39.83 per ton, the Quincy crude \$21.16 and the regular crude \$31.22 per ton. The dividends paid during the year aggregated \$1,044,000, making the total to date \$4,635,000, and, the statement says, is practically 50% of the mine's total earnings, which aggregate \$8,955,512.97. All this, excepting about \$336,000, has been taken out of the mine during the past six years. Compared to a year ago the cash reserve shows that it lacks just \$170,847.83 of being as much as stated in the report issued at that time.

#### Tooele County.

The Con. Mercur G. M. Co. has leased the Manning mill at Manning to Glazier & Brisco, who will operate it on ore from the dump.

Connection between the long drain tunnel with which the properties of the Honerine M. Co. at Stockton have been undermined and the new shaft through which the ore is to be dropped into the avenue below, and delivered to the mill without, has been made and the management will begin the delivery of ore through that outlet.

#### Utah County.

At Provo the Garden City M. Co. has completed the chute to carry the ore 1200 feet from the upper tunnel to the bottom of the canyon, where it will be loaded on wagons and taken to the railroad. Work is progressing steadily on the lower tunnel, 300 feet below the upper tunnel.

In the American Fork canyon, the Wyoming mine will resume operations about the middle of March, when the shipping of ore will also commence. During the month that the Wyoming was closed down, a small force has been driving a tunnel which, it is expected, will tap the large ore body of the Wyoming 200 feet lower than any of its present workings. This will facilitate the handling of the ore. Miners are at work on the Shamrock property in American Fork canyon, on the Millar hill, near the Wyoming mine.—The operators of the Bog mine are in 275 feet on the 500-foot tunnel which they are running under Alta peak.

The Dutchman M. Co. will resume operations and sink a 500-foot shaft.

### WASHINGTON.

#### Okanogan County.

Henry Bahrs, manager of the Copper World Extension M. Co. at Loomis, says that he will sink the shaft to a depth of 500 feet and open up levels every 100 feet by drifting and crosscutting on the vein. He has ordered a 40 H. P. steam hoist, an 80 H. P. boiler, a 50 H. P. air compressor and three drills, a 5 H. P. suction fan, wooden tanks, piping and general equipment.

#### Snohomish County.

The Sultan River Placer M. Co. is to work its ground near Monroe under the management of W. R. Menzies of Everett.—The Index Miner reports that the addition to the Bunker Hill concentrator is about completed. One standard Wilfley concentrating table, a Wilfley bed for the slimer now in use and a dynamo will be put in. This will make three Wilfley tables in all in the mill. A generator will be installed at the power house and motors put in at the mill to run the concentrating machinery. This will give electric lights in the various tunnels. V. V. Clark, the superintendent of the mine, and A. W. Sales of the Mine & Smelter Supply Co. of Denver, Colo., have patented a process for the magnetic extraction of ore by the wet process by placing magnets on the Wilfley or other tables, thus drawing the iron to one side and allowing the copper concentration to take place simultaneously. This is designed to evade the drying of the ores or concentrates in a dry kiln.

#### Stevens County.

The channeler and other machinery for the Chewelah Marble Co., whose property consists of eighty acres of fine marble on Deep creek, near Northport, is being moved to the quarry preparatory to commencing operations on a large scale when Manager Hanke arrives.

### WYOMING.

The report of H. C. Beeler, State Geologist of Wyoming, shows the mineral production of Wyoming for 1904 to be 4,220,000 pounds of copper, \$42,000 in gold, 10,500 ounces of silver, 250,000 long tons iron ore and 4,996,828 short tons coal. A majority of the copper mined in the State was smelted there. The coal mines employed 9177 men.

### FOREIGN.

#### AUSTRALIA.

##### New South Wales

The mineral output of New South Wales for 1904 was valued at £6,402,558, as compared with £6,116,254 in 1903. The number of men employed was 37,837, as compared with 37,559 in 1903. The year's gold yield was 269,778 ounces fine, valued at £1,146,109, being an increase, as compared with the previous year, of 15,557 ounces. The silver output is valued at £2,249,482, being an increase of £622,906. The copper output is valued at £420,387, being a decrease of £42,253. The tin output is valued at £184,785, the largest for fifteen years. The coal output was 6,019,809 tons, valued at £1,994,952, being a decrease of 335,037 tons.

### BRITISH COLUMBIA.

The new Haberlin converter is being tried experimentally by the American Smelting & Refining Co. at its Pueblo, Colo., plant. The converter for the Sullivan is designed to reduce the sulphur and facilitate the free extraction of the zinc. The crude ore runs 20% sulphur. It is crushed coarse and is roasted in a revolving machine to cut down the sulphur charge to 8%, then further converted by a hot blast which heats the ore almost to fusion and cuts down the sulphur charge to 4%. The ore instead of being reduced to fine granules, is left in good sized pieces like coke, and the removal of the sulphur leaves air passages all through its texture. It is fed into the smelting furnace without the expense of briquetting. In the smelter furnace fusion is secured with speed as the blast is swept right through the porous ore. There are only two products from the smelter—the silver-lead bullion and the iron-zinc-sulphur slag. The third product—a sort of middlings, made from slag mixed with lead—is avoided. There is a reserve of ore in the Sullivan mine that runs 33% in lead and 14 ounces in silver. Superintendent Weeks is in charge of the smelter. The Sullivan Group Co. is controlled by C. Sweeney, G. Turner and the Federal Mining & Smelting Co.

The tonnage from the dozen Boundary shippers and treatment at three district smelters for last week was: Granby mines to Granby smelter, 9750 tons; Mother

Lode to British Columbia Copper smelter, 2874; Brooklyn to Montreal & Boston smelter, 2996; Rawhide to Montreal & Boston smelter, 2091; Sunset to Montreal & Boston smelter, 30; Mountain Rose to Montreal & Boston smelter, 132; Emma to Nelson and British Columbia Copper smelter, 363; Oro Denoro to Granby smelter, 66; Senator to Granby smelter, 264; Providence to Trail smelter, 60; Last Chance to Montreal & Boston smelter, 55; E. P. U. to Trail smelter, 20; total for week, 19,511; total for year, 129,040 tons. Boundary district smelters this week treated ore as follows: Granby smelter, 10,536 tons; British Columbia Copper smelter, 3838 tons; Montreal & Boston smelter, 6195 tons; total for week, 20,679 tons, or a total of 130,597 tons for the year.

At the mine, near Kimberley, 35 men are at work. The tramway 6300 feet long, connecting the mine with the Canadian Pacific railway, is running, and ore is being moved. The bins are complete, and ore is being crushed; a car of siliceous ore is daily received from the Quilp mine Republic, Wash. The Quilp has a contract with the Sullivan for supplying all the siliceous ores required.

Lime ore for flux is being received from the Hunter V mine near Ymir. It is a low grade silver product.

At Poplar, the Pluto mine ore is being sacked for shipment to the smelter. The quartz in the vein is 4½ feet in width, the schist in the ledge is 25 feet in width, both carrying gold values. The richer ore in the quartz is sent to the smelter or milled. The schist will pay to run through. Dr. Gilbert is in London to form a company and raise money to build a stamp mill at Poplar for reducing the ore of the Marquis and Gilbert group.

#### Atlin District.

The Mining Exchange reports that this winter 250 men are drifting; 150 on Spruce creek and most of the rest on Pine creek, Gold Run, or Boulder; but a few on Ruby, Wright, Birch and McKee. The longest tunnel on Spruce creek is that of the Fleming partnership. It is driven into the left bench 500 feet. At Boulder Creek, Black and Grant, working a "lay" from the French Co., cleaned up \$13,400 between the middle of October and Christmas. Their main drift is 900 feet long, with a face of 40 feet. They employ 40 men. The total output of Atlin up to the close of navigation exceeded \$500,000. Last year dredging was started; this year will witness the introduction of steam shovels, one to operate on Tar Flat, Pine creek; the other on Spruce creek below Discovery claim. A third shovel may be brought in for McKee creek in order to load pay gravel from the pits of the Hydraulic Co. into electric cars, which will transport the gravel to the lake at the mouth of the creek that it may be there washed. Another dredge is well under way, and an electric pole line 7½ miles long has been constructed, a basin excavated, and the framework commenced. It will be a 7½-foot open-connected dredge, and will be placed below the Blue Canyon on Spruce creek. One of the chief difficulties that the Gold Commissioner has to adjust is the apportioning of dumpage ground to creek miners and benchers on Spruce. That difficulty will be removed when the bed-rock flume that is now contemplated is completed. It will be built from the falls upstream and will likely be on a scale to carry all the water of the creek. In 1905, the following hydraulic companies will continue operations: Pine Creek Power Co., North Columbia Gold M. Co., Atlin & Willow Creek M. Co., on Pine creek; Spruce Creek Power Co. and Columbia Hydraulic Co., on Spruce creek; Amalgamated McKee Creek M. Co. on McKee creek; Atlin Lake Co., on Birch creek; Societe Miniere de la Colombie Britannique, on Boulder creek. Development will be continued on several quartz properties, especially on the "Beavis," where, it is reported, machinery will soon be installed.

#### Boundary District.

Superintendent Collins of the Montreal & Boston Con. mines is making a success of using black powder in the glory hole operations at the Rawhide mine, the result being an increased tonnage of ore broken at the minimum of expense. The plan used is similar to that on railway construction rock work, and M. J. Burns is in charge of the blasting operations at the Rawhide.

The Le Roi concentrator on the Black Bear ground will be in operation within ninety days. The ground dimensions of the structure are 40x120 feet, and it will be arranged, like all other mills of this character, so that the ore will fall by gravity from one process to the other. The capacity will be 150 tons of ore a day. It is thought the best results will be obtained by water concentration.

The following resolution has been passed by the Rossland Board of Trade:

Resolved, That this board views with alarm the proposal to introduce an eight-hour law for smeltermen, and is of the opinion that if the proposed legislation is passed it will tend to transfer to the United States the smelting of British Columbia ores, and thus deprive Canadian workmen of being employed in Canadian smelters, and that this resolution be telegraphed to the premier.

The Le Roi M. Co. at Rossland cables its London office: "Shipped from the mine to Northport during the past month 10,058 tons of specially selected ore, containing 4813 ounces of gold, 4286 ounces of silver and 225,600 pounds of copper. Estimated profits on this ore after deducting cost of mining, smelting, realization and depreciation, \$27,000. Expenditure on development work during the month, \$8750. Development of the mine continues to be satisfactory, principally on the 900 and 1450-foot levels."

The Great Northern Railway is hauling ore from Phoenix to Grand Forks. The company has erected big ore bunkers and is using steel ore cars. About 300 tons of Granby ore is hauled daily from No. 3 tunnel level of the Granby, brought to the bunkers by three electric locomotives.

It is reported that development on the Nellie Cotton group, adjoining the Granby mines, will be started by April 1.—B. Perkins has started shipping ore from the Riverside group, Kettle river, 3 miles from Rock creek.—J. W. Nelson has received the smelter returns of a 22-ton ore shipment from the Rambler mine, west fork of Kettle river. The shipment netted \$73.24 per ton.—D. McIntosh is putting in an 8x10 hoist in the



E. P. U. mine, at Providence, which has been equipped with a 25 H. P. hoiler and a No. 6 Cameron pump.—Two smelters at the Granby smelter, at Greenwood, are now operated with the new electric self-charging apparatus.

Cariboo District.

The Con. Cariboo Hydraulic M. Co.'s profit and loss account for 1904 shows the increase in debt for the season's work amounted to \$27,172.08, the balance at debit being \$51,707.90 against \$24,535.82 on Dec. 31, 1903. The operating expenses per manager's report were \$88,423.75, and the total value of bullion obtained was \$85,936.30, making a direct loss in operating account of \$2,487.45. The accrued interest on the bonds amounted to \$24,000. From Manager J. B. Hohson's report the total operating season was eighty-nine days, and the reasons of scanty precipitations and adverse conditions respecting the molting of the winter snows are again adduced. The total water used amounted to 184,889 inches, which washed 1,327,817 cubic yards of dirt, an average duty of 7 1/2 yards per inch. The total gold recovered from this yardage amounted to \$84,866.21, or an average yield of 6.38 cents per cubic yard. The average cost per cubic yard was 6 1/5 cents, making the loss per cubic yard on working alone about 3 mills.

Rossland District.

The report of ex-Manager Kirby of the War Eagle Con. M. & Dev. Co. shows that during 1904 the management devoted most of the time to developing the property and placing it on its present footing; 61,064 tons were extracted and disposed of at a profit of \$80,000. The average value per ton was \$12.45. The War Eagle is now in a position to more than double its output of last year. Since the last annual report 2220 feet of headings have been driven. New shoots of high-grade ore have been discovered and blocked out in many directions, and old stopes have been opened.

The number of men employed at the different mines in the Rossland district is as follows: War Eagle, 120; Center Star, 210; Le Roi, 250; Le Roi No. 2, 116; White Bear, 30; Spitzee, 25; Jumho, 25; small properties, 24—total, 800.

Chairman McLean, of the Velvet-Portland company, is expected to arrive at Rossland from London to resume work on the properties of the company and restart the 100-ton concentrating mill. W. M. Thompson, the consulting engineer of the company, is expected to arrive from Mexico.

Slocan District.

The lessees of the Payne mill have contracted with the owners of the Beatrice mine, in the Lardau, to concentrate 1000 tons of ore.—The mill at the Cork mine, on the south fork of Kaslo creek, in the Ainsworth division, is completed. It is expected that a large force will be put to work as soon as P. Maris, the manager of the mine, returns from France.—An option has been given by C. A. McLeod on the Mountain Con. group to M. S. Logan of Nelson for \$67,500. The group consists of the Mountain Con. and Castick claims, on the divide between the south fork of Kaslo creek and Cody.

Southeast Kootenay District.

The Prospector reports that R. B. Durant, placer mine operator at Perry Creek, is preparing to sink a shaft to bedrock near Old Town.—J. Thompson and E. Banks have a shaft down 44 feet. As soon as the bottom deposit of gravel is reached drifts will be started in two directions in search of a rich run of pay gravel.—J. Henneberry has commenced permanent work on his placer lease on Perry creek. A hoisting plant and Cameron sinking pump has been put in. A shaft is down 40 feet.—Collins & Armstrong are drifting on a bench above Old Town and are in 60 feet.—M. Shilling is drifting for an old channel near Sawmill creek.

HONDURAS.

(Special Correspondence).—At San Juancito, 75 miles from the Pacific coast of Honduras, the New York & Honduras Rosario M. Co. has replaced primitive methods of mining by the most modern. According to the company's report for the year ending Sept. 30, 1904, an average of 861 men were employed. During the year 5264 feet of drift and crosscut and 1443 feet of raises were driven. Two continuous chutes, passing 1500 feet through the whole vertical extension of the mine, have been completed, so that the entire output is drawn from the lowermost adit. The cost of mining averaged \$13.33 per ton, of sorting 58 cents and of aerial transportation to the mill 42 cents. The ore is crushed in a stamp mill, amalgamated and concentrated. It has been the practice at the Rosario to treat the ore by pan amalgamation for years; but it is now known that a larger net result can be obtained by simple plate amalgamation and concentration. The Rosario is the most important mine at present operating in Honduras. It has been worked steadily for twenty-five years by the American company, after having been worked in primitive manner by the native miners for years prior to the purchase by the present owners. The price paid for the property, including several buildings, is stated to have been but \$11 gold. Nearly \$400,000 was then expended in development and equipment, and during the first four years of its operation by the American company less than \$10,000 in bullion was shipped to New York. A new manager was appointed, and during the year ending June, 1885, over \$600,000 was shipped in silver-gold bullion. Since that date the mine has been a steady but somewhat variable producer. It is 18 miles by trail from Tegucigalpa, the capital. There are no roads, except those owned by the company and made during the early period, and extending from the mill to the mine; cost, \$20,000. The cost of packing ore over this road was \$4.50 per ton. In 1885 the first aerial tramway was built, and the cost of transportation by this method is now said to be 42 cents per ton. The mine is located on a high, steep mountain side, cut by rugged canyons. The mill and town of San Juancito are located in a valley-like widening where a branch canyon joins the main canyon. The vein, which is a fissure, often showing comb structure, varies from 3 to 15 feet in width. The country rocks are a dense, black massive to slaty rock, traversed by veinlets of calcite. It is extremely hard and development work in rock of this character is expensive. This slate is intruded by an igneous rock, variously described

as syenite, rhyolite, etc. The vein courses through both slate and eruptive rock without noticeable change in the value or character of the ore. The ruins of the old reverberatory and other furnaces and metallurgical works may still be seen in the canyon below the village of San Juancito. With proper transportation facilities, there are many other mines in Honduras which would prove profitable under experienced management. There are numerous gold-bearing veins in the department of Olancho on which only superficial development has been done, and silver mines, both ancient and newly discovered, are numerous in the Republic.

Puerto Cortez, Feb. 16.

PERU.

The following is official and shows the duties imposed upon electric and gas equipments imported into the republic of Peru:

DESCRIPTION.	Minimum Value Per 2 1/2 Pounds.	Rate of Duty, %.	Duty Per 2 1/2 Pounds.
General supplies, such as circuit breakers and fuses, circuit makers, keys, plugs, and electric switches of all kinds and types having china bases and tops.	\$ 60	40 24	
Do, with china bases and metal tops.	1 00	40 40	
Do, with slate or marble bases, with or without tops.	1 50	40 60	
Glass insulators, gross weight.	07	40 28	
Insulators, of clay and pottery ware, not over 0.03 meter in circumference, with or without pins, gross weight.	30	40 12	

MEXICO.

Returns are slow from the mining districts of Mexico; in consequence it is impossible to give an accurate report on the mineral production of the republic for 1904. Semi-official information, however, gives the following report of production for 1904. Silver is quoted at its coinage value, not at its commercial value, as in the United States:

Silver.....	\$82,200,000
Gold.....	32,500,000
Copper.....	19,700,000
Lead.....	6,000,000
Total.....	\$140,400,000

During the three years ending Dec. 31, 1903, Mexico exported more than \$31,000,000 in gold, more than \$125,000,000 in silver and nearly \$400,000 in other metals.

A mining company recently petitioned the secretary of hacienda to exempt from the coinage and assay taxes dross and residues and other second-class metallurgical products from smelters, which do not assay over 250 grams silver or ten grams gold per ton, says the Investor. The secretary has issued an order exempting those products and notice thereof has been sent to all custom house collectors.

Chihuahua.

The Vaticana M. Co., owning the Papa and Vaticana mines in the Almoleva district, has incorporated with J. F. Flynn president, H. L. Warne secretary and G. A. Burr manager. The properties are being developed and an 8-foot vein of shipping ore has been opened that runs from 1500 to 2000 grams of silver, 8 to 10 grams in gold, 2% copper and 15% to 30% lead.

The Cia. Metalurgica de Torreón, owner of the Torreón smelter, at its recent annual meeting, reported the yearly profits for 1904 amounted to \$629,279.50, equal to 18% of the capital of \$3,500,000 invested. The general meeting declared a dividend of \$14 per share and \$12 for each share of common stock, payable April 30 next. In the year 1904 the total tonnage smelted was 201,612 tons of ore and fluxes. Two more furnaces were added to the plant, and now the Torreón smelter has in constant operation eight furnaces. Consequently, the capacity is 80% as large as the plant of No. 3 smelter in Monterey of the A. S. & R. Co. The Torreón Co. owns and controls 130,000 tons of lead ore, blocked out in the Cahrillas mine, near Saltillo, on the National Railroad; San Diego mine, in Santa Barbara, Chihuahua; Las Adargas, near Jimenez, and also in the Valadara mine, Aztec and Carbonato properties adjoining Valadara.

Coahuila.

A company composed of British and German capitalists has been formed to work a recently discovered coal field near Sabinas. The principal vein is from 7 to 8 feet wide, and underlies an area of 15,000 acres. The new coal fields is 7 1/2 miles from the Mexican International railway. Coahuila already produces 3000 tons of coal and 1500 tons of coke daily.

Michoacan.

The Rothschilds are reported investigating and negotiating for large copper properties in this State in the Inguaran district. Should the report be favorable it is expected that a railroad will be constructed from the mines to the present main line of the Central or to Zihuatanejo on the Pacific coast. The sale of these mines depends upon the output and also upon the facility for construction of a railroad and it has been estimated that the mines can produce 18,000 tons annually.

Monterey.

The Laredo M. & S. Co. are working La Mina B in the Galeana district, near Monterey, under the management of W. H. Banks. The 6-mile wagon road from the mines to Galeana is being completed. C. G. Brewster is president of the company at Laredo, Texas.

Sonora.

The Wisconsin-Mexico M. Co., of Milwaukee, Wis., operating the Plomosa, Iris and Oh'Gee mines, near Huapac, 125 miles north of Hermosillo, on the Sonora river, is constructing its stamp mill, for which all machinery is on the ground and the work progressing under direction of R. Graham. When finished the company will have a complete equipment, having already a thirty-ton smelter, briquetting machines, etc. Development of the mines is also going on, and within sixty days the company should be ready to commence treating their ores.

S. Crump says the Yaqui war is of greater proportions than is commonly supposed. Recently a number of Mexicans were killed by the Indians south of Arizpe, and it

is now impossible to get Mexicans to go into the hostile country on any pretext. A short time before the Indians took the war path he saw about 100. Most of the men had 30-30 Winchesters and cartridges. Mr. Crump had a 30-30 and a belt full of ammunition; the Indians offered him several good ponies for 100 cartridges; he refused to trade and they offered him a piece of land for the ammunition, but he would not let his cartridges go.

Nogales reports that the mining industry to the south of that city is paralyzed on account of fear of the depredating Yaquis. The Benson Press notes that many mining men who came out of Sonora on account of the Indian scare, or had turned back from their trip there, were now making examination of the mining districts on this side of the international line in Arizona.

SOUTH AFRICA.

The December gold production of South Africa shows: Number of mines making returns: Rand, 61 (5555 stamps); Heidelberg, 1 (50 stamps); Barberton, 5 (145 stamps); Klerksdorp, 1 (— stamps); Lydenburg, 2 (70 stamps); total, 69 (5835 stamps).

SUMMARY.

	Ozs. (fine).	£
Mill.....	310,470	992,247
Concentrates.....	19,217	82,058
Slimes.....	94,775	402,576
Slimes.....	15,887	67,484
Banks, etc.....	440	1,869
Tons Milled.		
Rand total.....	778,916	349,289
Outside totals.....	29,125	12,375
Transvaal total.....	818,041	362,264
		1,538,800

Personal.

R. A. PARKER has returned from California to Denver, Colo.

D. C. BAKER of Deadwood, S. D., is in New York City on mining business.

C. E. FINNEY has returned from Colorado Springs, Colo., to New York City.

WILLIAM P. MILLER, JR., is in the State of Guerrero, Mexico, examining placers.

G. WINGFIELD has been appointed manager Booth G. M. Co. at Tonopah, Nev.

ALEX. MOFFATT will resign as superintendent Ontario mill at Park City, Summit county, Utah.

JAMES PRYOR of Jerome, Ariz., is engineer Oro Grande mines, southeast of Martinez, Ariz.

J. A. BUTCHART, secretary and treasurer Ophir Tunnel Co., is at Ophir, Utah, from Duluth, Minn.

A. F. HOLDEN of Salt Lake City, Utah, has been examining the Mammoth mine, in Shasta county, Cal.

C. C. JEWELL has been made manager Free Gold M. & M. Co. at White Oaks, Lincoln county, New Mexico.

R. N. DICKMAN of Dickman, Mackenzie & Potter of Chicago, Ill., is in Arizona examining mining properties.

C. W. PLATT of Prescott, Ariz., is superintendent Monarch M. & S. Co., 12 miles northeast of Wickenburg, Ariz.

W. J. CRAIG has resigned as superintendent Yampa mines at Bingham, Utah, and will look after private interests.

JOHN STALLINGS, Lincoln mine, near Pearl, Idaho, has been examining mines at Good Springs, Lincoln county, Nev.

PIERRE WIBAUX, president Clover Leaf G. M. Co., at Roubaix, S. D., has returned to South Dakota from Paris, France.

J. T. LANGFORD of Stockton has been appointed superintendent Rio Vista copper mine near Fairplay, El Dorado county, Cal.

P. J. MINITER, formerly chief assay department for the Government at Deadwood, S. D., is examining mines on Cherry creek, near Prescott, Ariz.

ARTHUR H. BUCK has resigned as superintendent N. Y. & Honduras R. M. Co., San Juancito, Honduras, C. A., and will return to Denver, Colo.

C. MAUNDER has been appointed superintendent California & Nevada M. Co., adjoining the Kane Wonder mine in the Funeral range, Ballarat, Cal.

M. M. HOWE, general manager for the Senator M. Co., has returned to Breckenridge, Colo., from a business trip to Boston, New York and Washington.

J. C. ERMAN has resigned as engineer in charge Starlight mines at San Carlos, Ariz., to become manager Keystone copper mines at Globe, Ariz.

HORACE F. BROWN of San Francisco, Cal., has gone to Pittsburg, Pa., to continue his experiments commenced there last summer in the making of steel by a new process.

C. A. PARSONS, manager Mercantile Finance Co., Chicago, Ill., is in San Francisco, Cal. His company has recently acquired the Moose creek placers at New-some, Idaho, which he will operate this season.

ROBT. FORSYTH has been elected president Union Iron Works, San Francisco, Cal. Mr. Forsyth has been engineer in chief of the Union Iron Works for twenty years. Geo. Fredericks has been elected vice-president, Chas. N. Champion secretary, H. S. Snyder treasurer.

RUFUS BUCK, E. M., who is engaged in mining engineering work near Dawson, Yukon Territory, is in San Francisco, Cal., on a visit. He returns to the north as soon as transportation opens in the spring to continue the extensive work of ditch and flume construction in which he was engaged last season.



## Commercial Paragraphs.

H. L. SINCLAIR, manager of the Denver, Colo., branch of the Hardsocg Wonder Drill Co., is spending some time at the works, Ottumwa, Iowa.

J. A. THOMAS succeeds F. H. Johnson in the management of the mining department of the Fulton Iron Works, whose new office address is 17 First street, San Francisco, Cal.

W. A. HENDRYX, manager of the Hendryx Electro Cyanide Co., is installing a testing plant at 1738 Broadway, Denver, Colo., where he will make tests by the Hendryx process.

B. A. SCHRODER, for some time attached to the St. Louis office of the Crocker-Wheeler Co., has been placed in charge of the New Orleans office of the company, succeeding P. Field, who has been transferred to the Boston office.

CYANIDE TANKS and equipment to increase the capacity of the cyanide plant of the Black Range M. Co., Magdalena, N. M., from 50 tons to 150 tons daily capacity are being furnished by The S. H. Supply Co. of Denver, Colo.

THE first of a series of bulletins from the Ingersoll-Sergeant Drill Co., 26 Cortlandt St., New York, describes labor-saving tools operated by compressed air. No. 2000 describes the Macdonald rivet forge. The series will be sent to any address.

H. L. WOOLFENDEN, manager of the Denver branch of the Gilbert Wilkes Co., has resigned and in future will have charge of the Bullock electrical machinery of the Allis-Chalmers Co. and will be associated with R. B. McConney, manager of the Allis-Chalmers Co. Denver, Colo., branch, with offices at 1649 Tremont St.

THE Mammoth Copper M. Co. of Salt Lake City, Utah, has just placed an order with the Westinghouse Electric & Manufacturing Co. for a total of nearly 800 H. P. in induction motors of different sizes, together with a motor-generator set, transformers, switchboard and three mining locomotives. The motors will operate on three-phase, 2000-volt circuits.

## Books Received.

The future importance of New Mexico as a mining country is ably set forth in "New Mexico Mines and Minerals" by F. A. Jones. The book gives a complete account of the mining history, mineral resources and known geology of New Mexico's ore deposits. In a general way it presents much of interest and value. Being somewhat of a popular treatise, it omits some details as to mine management and working that is of interest to the mining fraternity. Its value as a reference book would be greatly enhanced by an index. It is published by F. A. Jones, Santa Fe, New Mexico, for \$2, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

The U. S. Geological Survey Bulletin 261, "Preliminary Report on the Operations of the Coal Testing Plant at the Louisiana Purchase Exposition," gives an account of the various tests and results of a number of coals. It is of interest in describing methods and giving properties of coal tested. Bulletin 242, on the "Geology of the Hudson Valley Between the Hoosic and the Kinderhook," by T. N. Dale, is a valuable contribution to the structural geology of New York State. Bulletin 288, "The Economic Geology of the Iowa Quadrangle, Kansas," by G. I. Adams, E. Haworth and W. R. Crane, gives an interesting account of the oil and gas occurrences of southeastern Kansas. The rock formations are interstratified shales, sandstones and limestones, which have a northeast-southwest strike. The sandstones are the principal oil and gas reservoirs. The occurrence of the oil and gas points to an organic origin. The gas is largely used in smelting zinc ores, of which a brief account is given. Cement, lime and clay are economic products of the region.

No engineer of to-day can do his work without a thorough grounding in the principles of mechanics. "Elements of Mechanics," by Mansfield Merriman, gives an elementary but concise introduction to these principles. The book is clearly and logically written and requires only a knowledge of plain geometry, elementary algebra and plane trigonometry for intelligent study. It is intended as an introduction to analytic and applied mechanics. It would seem that the author has taken the mathematical rather than the physical view of the subject. Naturally the subject offers little field for originality in its elementary phases and many books have already appeared containing essentially the same subject matter; the chief reason for its appearance seems to be that it omits much of the higher mathematics and brings the subject within the range of the less advanced student. The author evidently does not respect poetic license, inasmuch as he presents a problem to analyze the athletic feats of Hiawatha. The book is published by John Wiley & Sons, 43 East Nineteenth street, New York City, for \$1 and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

The appearance of a fourth edition of "A Manual of Mining," by M. C. Ihseng, is in itself a good recommendation for this work. The former editions have long served the purpose of giving an intelligible account of mining methods, and the addition of 150 pages brings this pretty well up to date. No one will ever become a mining man from the mere reading of Ihseng's book or of any other book, but this will give a comprehensive and general idea of the many sides of the subject, that

could otherwise be gained only by years of observation. The parts on methods of mining are lacking in suggestions as to overcoming difficulties in metal mining. The chapters on handling material are applicable either to coal or metal mining, likewise those of pumping. A book of this kind is necessarily a compilation of many works, and while the latest edition contains much that is new, yet it also contains many old illustrations. One wonders if there have been no recent applications of some of the classical methods. On the whole, the book is as good an exponent of American practice as we have and amply repays study. It devotes more space to power and its transmission than is usually done. It is published by John Wiley & Sons, 43 East 19th St., New York City, for \$5, and will be sent post paid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Trade Treatises.

Form 35 A from the Ingersoll-Sergeant Drill Co., 26 Cortlandt St., New York, gives that company's latest exemplification of air compressors.

The Westinghouse Electric & Manufacturing Co. of Pittsburgh describes its type F induction motors for variable speed work and its type R direct current motors in sizes from  $\frac{1}{2}$  to 1  $\frac{1}{2}$  H. P. in folders Nos. 4038 and 4039.

## Obituary.

EDWARD HALLAM, aged 22 years, was killed in the Kennedy mine, at Jackson, Cal., on March 6.

G. W. KRAMER, a mining man of Washington, Nevada county, Cal., died of consumption at San Jose, Cal., March 4.

ROLAND C. LUTHER, second vice-president of the Philadelphia & Reading, who as a mining engineer developed silver mines in Nevada from 1875 to 1882, died March 6, aged 59 years, at Pottsville, Pa.

## Latest Market Reports.

SAN FRANCISCO, March 10, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 27 $\frac{1}{2}$ d (standard ounce, 925 fine); New York, har silver, 58 $\frac{1}{2}$ c, refined (1000 fine); San Francisco, 58 $\frac{1}{2}$ c; Mexican dollars, 48 $\frac{1}{2}$ c, San Francisco; 45 $\frac{1}{2}$ c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37 $\frac{1}{2}$ @15.50; Electrolytic, 1 to 3 casks, \$15.37 $\frac{1}{2}$ ; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; hars, 18@24c. London: £68 3s 9d spot per ton.

Copper shows signs of weakness and prices are a little lower than those quoted last week. The latest quotations, however, are slightly higher than those of a day or two previous.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12 $\frac{1}{2}$ ; San Francisco, \$3.70, carload lots; 4 $\frac{1}{2}$ c 1000 to 4000 lbs.; pipe 6 $\frac{1}{2}$ c, sheet 7, bar 5 $\frac{1}{2}$ c; pig, \$4.85. London: £12 5s  $\frac{1}{2}$  long ton.

SPELTER.—New York, \$6.25; St. Louis, \$6.30; London, £24  $\frac{1}{2}$  ton; San Francisco, ton lots, 6 $\frac{1}{2}$ c; 100-lb lots, 7c.

TIN.—New York, pig, \$28.50@29.00; San Francisco, ton lots, 30c; 500 lbs., 30 $\frac{1}{2}$ c; 200 lbs., 30 $\frac{1}{2}$ c; less, 31c; har tin, 31 $\frac{1}{2}$ c. London, £135 5s.

PLATINUM.—San Francisco, crude, \$18.50  $\frac{1}{2}$  oz.; New York, ingot, \$19.50  $\frac{1}{2}$  Troy oz. Platinum ware, 75@82c  $\frac{1}{2}$  gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00  $\frac{1}{2}$  flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 $\frac{1}{2}$ c; extra, 17 $\frac{1}{2}$ c; genuine, 31 $\frac{1}{2}$ c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb. lots, 19.75c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure,  $\frac{1}{2}$  lb., 50c; dust,  $\frac{1}{2}$  lb., 10c; sulphate,  $\frac{1}{2}$  lb., .04c.

NICKEL.—New York, 55@60c  $\frac{1}{2}$  lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c  $\frac{1}{2}$  lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.85@17.10; gray forge, \$16.85; San Francisco, har, 3c  $\frac{1}{2}$  lb., 3 $\frac{1}{2}$ c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c  $\frac{1}{2}$  lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6 $\frac{1}{2}$ c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1c  $\frac{1}{2}$  lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price.

Dry Lead.—In hbls., 1 ton and over, 6 $\frac{1}{2}$ c; do. in kegs, 7c. LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 cts, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city  $\frac{1}{2}$  hbl.

CEMENT.—Imported, \$2.15@2.65  $\frac{1}{2}$  hbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40  $\frac{1}{2}$  hbl. in sacks, 4 sacks to hbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 8 $\frac{1}{2}$ c; Hallett's, 8 $\frac{1}{2}$ c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9 $\frac{1}{2}$ c; 100-lb. lots, 10 $\frac{1}{2}$ c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in hulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15 $\frac{1}{2}$ c; less than one ton, 17 $\frac{1}{2}$ c. No. 1\*, 60%, carload lots, 13 $\frac{1}{2}$ c; less than one ton, 15 $\frac{1}{2}$ c. No. 1\*\*, 50%, carload lots, 11 $\frac{1}{2}$ c; less than one ton, 13 $\frac{1}{2}$ c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9 $\frac{1}{2}$ c; less than one ton, 11 $\frac{1}{2}$ c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s, 11c  $\frac{1}{2}$  set; 14 oz., 40s, 9 $\frac{1}{2}$ c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c  $\frac{1}{2}$  lb.; carloads, 23@23 $\frac{1}{2}$ c; in tins, 30c; soda ash, \$2.00  $\frac{1}{2}$  100 lbs.; hyposulphite of soda, 3@3 $\frac{1}{2}$ c  $\frac{1}{2}$  lb.; caustic soda, in drums, 3@3 $\frac{1}{2}$ c  $\frac{1}{2}$  lb.; Cal. s. soda, hbls., \$1.10@1.20  $\frac{1}{2}$  100 lbs.; sks., 90c@1.00; chloride of potash, 12@13c; nitrate of potash, 6 $\frac{1}{2}$ @7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2 $\frac{1}{2}$ @2 $\frac{1}{2}$ c; powdered sulphur, 2 $\frac{1}{2}$ @2 $\frac{1}{2}$ c; flour sulphur, French, 2 $\frac{1}{2}$ @—c; alum, \$2.00@2.25; California refined, 1 $\frac{1}{2}$ @2c; sulphide of iron, 8c  $\frac{1}{2}$  lb.; copper sulphate, 5 $\frac{1}{2}$ @5 $\frac{1}{2}$ c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1 $\frac{1}{2}$ @2c  $\frac{1}{2}$  lb.; nitric acid, carboys, 8c  $\frac{1}{2}$  lb.

OILS.—Linseed, boiled, hbl., 60c; cs., 65c; raw, hbl., 58c; cs., 63c; Lucol oil, boiled, hbl., 51c; cs., 56c; raw hbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As, tral, 19c; Star, 19c; Extra Star, 22c; Ecocene, 21c, Elaine, 25c; Water White, in hulk, 12 $\frac{1}{2}$ c; Mineral Seal iron bbls., 18c; wooden bbls., 20c; cs., 24c; Minera; Sperm, cs., 26 $\frac{1}{2}$ c; Deodorized Stove Gasoline, hulk, 16c, do., cs., 22 $\frac{1}{2}$ c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19 $\frac{1}{2}$ c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, hbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c  $\frac{1}{2}$  lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c  $\frac{1}{2}$  lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c  $\frac{1}{2}$  lb.

MOLYBDENUM.—Best, \$2.75  $\frac{1}{2}$  lb.

CHROMIUM.—90% and over,  $\frac{1}{2}$  lb., 80c.

PHOSPHORUS.—American,  $\frac{1}{2}$  lb., 70c.

SILVER.—Chloride,  $\frac{1}{2}$  oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase,  $\frac{1}{2}$  lb., 7c; less than 500 lbs., 7 $\frac{1}{2}$ c.

MANGANESE.—Per lb., \$2.75.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads, \$1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic,  $\frac{1}{2}$  ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR WEEK ENDING FEBRUARY 23, 1905.

783,990.—PUMP—J. Reusher, Seattle, Wash.  
783,773.—BICYCLE SEAT—E. E. Brown, Los Angeles, Cal.  
783,608.—JAR CLOSURE—W. C. Rubles, S. F.  
783,610.—BARREL VENT—M. J. Chaplin, Seattle, Wash.  
783,619.—TREATING SALT—H. C. Coward, Oakland, Cal.  
783,821.—THRESHER FEEDER—A. C. Critchfield, Rosalia, Wash.  
783,624.—ARTIFICIAL FUEL—J. T. Davis, S. F.  
783,686.—NUT LOCK—J. T. Davis, S. F.  
783,699.—BAKE OVEN—A. Edwards, Redlands, Cal.  
783,571.—SEPARATOR—C. Fricks, S. F.  
783,631.—CABLE CLIP—W. Gregor, Barron, Wash.  
783,575.—SEWER FORM—C. Gustafson, Oakland, Cal.  
783,663.—CATTLE GUARD—A. C. Hendryx, Portland, Or.  
783,580.—DESIGN PRINTER—G. A. Herzog, S. F.  
783,657.—TRACK CLEARER—S. F. Hudon, Wenatchee, Wa-h  
783,489.—FEED WATER HEATER—J. M. Keller, Los Angeles, Cal.  
783,531.—LITERARY BOOK—E. Kendall, S. F.  
783,435.—TILING PACKAGES—L. Olson & Peterson, Spokane, Wash.  
783,908.—TRUNK STRAP—Fanny A. Lyman, Seattle, Wash.  
783,647.—ROPE CLIP—B. C. Rhiet, Spokane, Wash.  
783,594.—FLOW—E. J. Rubottom, Felton, Cal.  
784,011.—BALE—A. M. Sheakley, Stockton, Cal.  
784,014.—NUT LOCK—A. P. Steel, Stockton, Cal.  
783,905.—HAME—T. E. Stockford, Leesville, Cal.  
783,711.—TIME SWITCH—C. J. Sullivan, San Jose, Cal.  
784,018.—SUTURE SUPPORT—O. D. Withersee, Los Angeles, Cal.  
783,810.—ARTIFICIAL FUEL—H. R. Woltman, Berkeley, Cal.  
783,919.—GAS BURNER—J. P. Yoho, Seattle, Wash.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

ORE FURNACE.—No. 783,903. Feb. 28, 1905 August Skoog, Shreveport, La. This invention relates to improvements in ore furnaces, and particularly in upright furnaces used for roasting quicksilver ores. Its object is to provide a furnace of this character which may be operated continuously, one wherein the ore may be acted on by the heat from all sides and wherein the heat is also made to pass through the contained ore and out again, carrying with it the mercurial vapors, and one wherein the ore will be dried as it enters the ore chamber, so it will not hang upon the tiling.

HAME ATTACHMENT.—No. 783,908. Feb. 28, 1905. T. E. Stockford, Leesville, Cal. This invention provides a convenient adjustment and in connection therewith a guard plate which protects the collars worn by horses, and prevents injury. It comprises a guard plate which extends across the belly of a horse collar and interchangeable from one horse member to another, said plate having its front edge hinged to one of said members and having a vertical series of slots in the opposite edge, a pin passing through the said series of slots to adjustably receive draft attachments, said pin having a transverse slot, and springs at opposite sides of the center of the plate in the path of the pin, whereby said pin may be inserted from the top and locked, whichever edge of the plate may be upward.



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Curving the Pipe by Means of Chain Blocks.



The East End of Syphon No. 3.



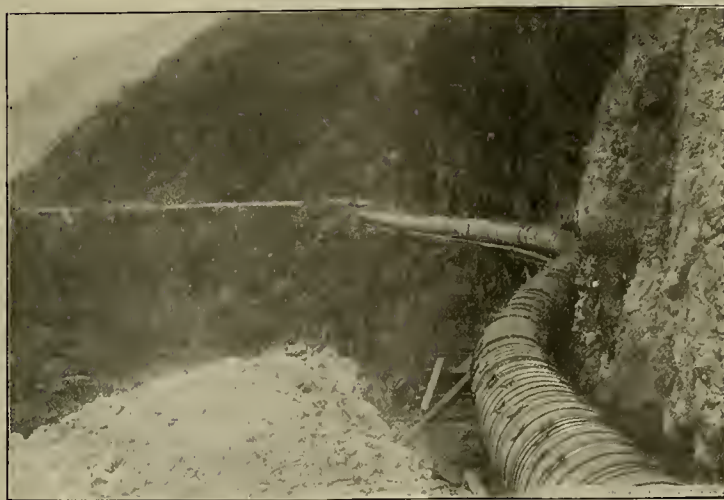
Pipe Line Skirting a Perpendicular Cliff.



Approach to Tunnel on 70-Foot Trestle, Built on 200-Foot Radius.



Hoisting Plant in Operation.



Looking up the Line 2 Miles Below the Headworks.

Views Along the Line of the Wood Stave Pipe of the Washington and Oregon Power Co., in Northeastern Oregon.  
(See Page 169.)



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THE proposed changes in stamp mill practice in the Lake Superior copper region are of some importance to the copper industry and particularly to that district. It is intended to compound the stamp heads, by means of which a double head, it is estimated, will increase the output about 50%, at small increase in cost of power and other expense of operation. This will materially cheapen the cost of producing copper on the Lake, and will doubtless increase the output also. The proposed change has passed the experimental stage, as the idea has been given extended trial at the Osceola and other mills, and pronounced a success. The increase in stamping capacity will either result in running of fewer heads at less expense than at present, with about the same output, or with increased output means elaborate changes and additions to concentrating and other machinery in existing mills.

WHEN hydraulic mining was at its height in California, and was carried on without restriction, the cost of washing the gravel per cubic yard was reduced to a figure so low that this class of mining came to be acknowledged as the least expensive in the world, for the amount of material moved. There was considerable variation in this expense at the various mines, it is true, dependent on the thickness of the gravel deposit, the available grade; and amount and pressure of water obtainable, as well as the character of the gravel itself, but most of the larger mines operated at a cost ranging from about 3.7 cents to 7 or 8 cents per cubic yard. At that time no one thought that in a few years dredging for gold would become a great industry, or if anticipated, that the cost of mining by this method would compare favorably with the cost of hydraulicking on a large scale, but such is to-day the fact, for dredging in California has been reduced, in the Oroville

region, to a figure corresponding closely with that of operating the great hydraulic plants of the '70's. A well equipped dredge of large capacity, and gravel which does not offer too many difficulties to its handling, can wash gravel at a cost of about 5.5 cents per cubic yard.

## Smelter Fumes Again.

The United States Circuit Court has issued an injunction restraining the Mountain Copper Company from further damaging the forests in the vicinity of Keswick, Shasta county, Cal. This suit has been dragging along for several years with the result that the Government has finally secured a victory, but it is a victory of questionable value. The forest about Keswick consists chiefly of scattering nut pine, brush and a few oaks. That the smelter fumes have injured this sparse and stunted growth of trees there is no doubt, and, also, the contention of the Mountain Copper Company that the damage was relatively slight is, without doubt, true, but evidently a principle must be upheld, and, as a result, the town of Keswick, with all of its prosperity and diversity of commercial interests, is doomed. The Mountain Copper Company has given employment to more than 1000 men at its smelters, and a single monthly wage paid to these men would pay for all the timber situated within the zone in any manner affected by the smelter fumes. The plant at Keswick is a large one and contains a complete and extensive equipment. There are five water-jacket furnaces, having a combined daily capacity of nearly 2000 tons. There are eleven calcining furnaces, three converters, and a large amount of other machinery. Thousands of tons of ore have been heap-roasted in the past, and the fumes from these heaps, as well as from the stacks, has afforded numerous opportunities for complaint on the part of small farmers who will now find that they have lost the only market for their products which they have had for years. The works has also afforded a market for the gold-bearing siliceous ores of the district, but with the closing down of the works which will probably follow this recent court decision, Shasta county will have lost a most important factor in its commercial life. Among the harrassing experiences to which the company has been subjected was a strike of union miners, in 1903, which was continued for months, but in which the company was eventually victorious. Expensive fires have also occurred in the mines of the company, and it has had other misfortunes to contend with. In anticipation of the probable final outcome of the suits instituted against the company, extensive arrangements have been made to transfer a large part of the reduction of their ores from Keswick to a new plant in Contra Costa county, Cal., near the town of Martinez.

Within a few days it has been reported that money has been subscribed with which to carry on litigation against the Selby Lead & Smelting Co., whose works are at Vallejo Junction, in Contra Costa county, Cal. The principal complainants are said to be the residents of the vicinity of Benicia, in Solano county, on the opposite side of the Straits of Carquinez, and 6 miles distant in an easterly direction. The Selby Works have been in operation there for many years, and it would seem that the discovery has just been made that the fumes from the stacks are injurious. The only method as yet pointed out by which the various smelting companies of the West may hope to continue business is that they may engage in the making of sulphuric acid as a by-product of their smelting operations. This is entirely practicable, but it involves a large outlay of capital for plant, and considerable expense thereafter in carrying on the acid making. But after having made this great quantity of acid there will be no market for it which can be reached by the manufacturers where the product would bring a price which would even pay for the cost of manufacture. It has been suggested that the acid could be employed in the leaching of partially roasted ore, thus saving the expense of smelting. It is not a difficult matter for one with a knowledge of chemistry to work out scientific processes on paper, but the business of mining and smelting of copper ores is not conducted for the purpose of demonstrating scientific theories, nor even facts, but for profit, and when no profit results from the operation the proposition usually comes to a standstill sooner or later.

## Gold Mine Reserve Fund.

A liberal treasury cash balance, or an amount of gold bars on hand equal to about a month's output of the mine, is a desirable thing, but one which few mining companies carry, because of the demand for dividends on the part of the stockholders. There are few metal mines where the bullion output is absolutely regular from month to month, but by placing the amount at a fair month's average of a year's run, this amount may be readily ascertained—and if a surplus of amalgam or gold bars be kept on hand by the superintendent, under ordinary conditions, the monthly output can be regulated so as to approximate a stated sum. In some mines it is possible to do this by selecting the grade of ore to be treated, if there is considerable difference in the grades of the ore. Particularly is this the case with a low-grade mine having rich streaks. Should the output for the month be running behind the average, toward the latter part of the period, the superintendent, who is aware of this fact, directs the foremen to break a given number of tons of ore from known rich streaks, veins or deposits which have been held in reserve for such a contingency. By this means the average may be maintained, or a discrepancy may be adjusted, by adding amalgam from the reserve on hand.

Nothing gives such confidence in a mining stock as regular and continuous dividends, and nothing makes stock values so unstable as irregular dividends. Some believe that by holding a reserve the management is enabled to work low-grade ore which could not otherwise be worked, but this is not a fact. Any ore too low grade to work can not be made better or worked less expensively by drawing upon the treasury reserve or the amalgam safe. It is often the case, however, that the mining of rich streaks and bunches from a body of low-grade material, while the poorer rock is left undisturbed, results in closing a good property too early in its career. This system of mining, known as "gouging" or "gutting" a mine, is sometimes resorted to for the purpose of making a good showing for the manager, who, when he can proceed no further, resigns with a good record, leaving a gouged mine for his successor. The low-grade rock may not justify extraction alone from partly caved and badly timbered ground, but had the poor ore been broken with the rich in the first place, the difference in the cost of mining may have made the low-grade ore profitable. Occasionally the result of such operations as outlined above is to cave a large mass of low-grade ore which thereafter may be recovered at a very low cost, there being little mining, as mining is generally understood, to do, as the cost of drilling and blasting holes, timbering and other incidental expenses are practically eliminated, but such fortunate outcome of the former bad policy is of rare occurrence and limited extent.

## The Mexican Dynamite Monopoly.

Although the dynamite monopoly seems to have been firmly established in Mexico, there is a possibility that it may be declared unconstitutional, and the proposition is attracting considerable attention from the Mexican press. Article 28 of the constitution of the Republic of Mexico is as follows:

"There shall be no monopolies nor privileged places of any kind, nor prohibitions with titles of protection to industry. Those only shall be excepted which relate to the coining of money, to the postoffices, and the privileges which, for a limited time, the law may concede to inventors or perfectors of some improvement."

One of the leading Mexican dailies, the Record, says editorially: "If this concession stands, what will it not lead to?"

The company having the monopoly of the manufacture and sale of explosives in Mexico has already had a protective tariff placed on dynamite about equal to the first cost of 40% dynamite in the United States, which means that mining companies operating in Mexico must pay two prices for explosives. It will at least have one practical effect—that of teaching miners to break ground with the least possible amount of powder. In any event, it can not but have a harmful and restraining influence on the development of the mines of Mexico.



## CONCENTRATES.

A MILLIMETER is about  $\frac{1}{25}$  of an inch—or, more correctly, 0.03937 inch; 26 millimeters = 1.02362 inch, or, practically, 1 inch.

\*\*\*\*\*

THE metal tantalum is rare, and the metallurgical processes by which it is produced from its ores are complicated. A German firm sells the metal at \$9.50 per gram.

\*\*\*\*\*

MUCH better light is obtainable at shaft stations underground if the timbers and exposed rocks be white-washed or painted white. By this means a better light can be had at less cost.

\*\*\*\*\*

IN regions where water power is available for only a portion of the year it is not uncommon to find auxiliary steam plants to replace the water power during the dry months. This permits economy of power cost during at least a portion of the year when the wheels may be utilized.

\*\*\*\*\*

SOME convenient hydraulic formulas are: Pounds pressure per square inch = 0.434 times the head of water in feet. Head in feet = 2.3 times the pounds pressure per square inch. The weight of a cubic foot of water = 62.4 pounds. The weight of a gallon of water = 8.33 pounds. There are 7.48 gallons in 1 cubic foot.

\*\*\*\*\*

A FORMULA by which the friction in water pipes may be calculated is as follows:  $F = \frac{L}{1000 D} (4V^2 + 5V - 2)$ .

In this F = friction head; L = length of pipe in feet; D = diameter of pipe in inches; V = velocity in feet per second.

\*\*\*\*\*

WHAT is known as the Boss process is a method of amalgamating in pans by passing the pulp from one pan to the next in a series, practically making it a process of continuous amalgamation. The chemicals employed are the same as those used in the Washoe process and are principally sodium chloride (salt), copper sulphate (blue-stone) and quicksilver.

\*\*\*\*\*

THE principal elements occurring in and forming the rocks and ores of the earth's crust are, oxygen 47.3, silicon 27.2, aluminum 7.8, iron 5.4, calcium 3.8, magnesium 2.7, sodium 2.4, and potassium 2.4. The other elements occur in almost infinitesimal quantities relatively to the others above mentioned. Carbon is, perhaps, the next most abundant element in nature.

\*\*\*\*\*

THE new mineral, said to resemble garnet in crystallization and general appearance, reported from Vienna, is heckite. It is said to contain combinations of cerium, lanthanum, and other rare earth minerals, similar to monazite. If found in sufficient abundance, this mineral will become a valuable source of these minerals, which are used in the manufacture of light mantles.

\*\*\*\*\*

"THE Story of Amalgamated Copper" is not being told in the Eastern magazine mentioned, nor is it likely that it will be so related. That story is not one of New York, but of Montana, the facts only procurable where they transpired. It has been related as those facts transpired seriatim, and the alleged publication of the "story" (as as yet unfurnished performance) is ascribable to other motives than a desire to serve the public.

\*\*\*\*\*

WHERE the rock in a shaft is hard but fissured by soft seams which interfere with drilling, it is advisable not to attempt to drill deep holes, and better to use a "cross" hit which fetches less easily than with a chisel bit. Short holes—2½ to 3½ feet—can usually be put in any kind of ground, and the blasting accomplished without unnecessary delay, but deep holes if lost by fitching may make considerable difference in calculated results of the round of holes.

\*\*\*\*\*

COPPER ORES range from about 24% in some varieties of chalcopryite to over 80% in pure cuprite (red oxide), but these ores are so mixed mechanically with gangue and associated minerals that few of what are recognized as copper ores commercially average over 10%. The richer portions of copper ore deposits are usually at or near the surface, or at least above the sulphide zone. The Copper Queen mine of Bisbee, Ariz., averaged about 23% for several years in the early '80's.

\*\*\*\*\*

MANY mistakes are made in planning mills for amalgamation, cyaniding and concentrating. Often it seems as though the fact that there is such a thing as gravity is lost sight of entirely, and where gravity may have been taken advantage of are found various mechanical devices, all of which cost money to install and a constant expense to operate and repair. Where gravity can no longer be employed there are a number of excellent devices for handling materials, ore, etc., among them bucket elevators and push and belt conveyors.

\*\*\*\*\*

THE specific gravity of copper is 8.93, that of aluminum 2.68. The relative conductivity for equal area for the two metals is, for copper 100, aluminum 63. Their weight for equal conductivity is, for copper 100, aluminum 48.

Area for equal conductivity, copper 100, aluminum 160. Diameter for equal conductivity, copper 100, aluminum 126. The relative diameters of copper and aluminum wires, to be of equal conductivity, show aluminum to be about two sizes (Brown & Sharpe gauge) larger than copper.

\*\*\*\*\*

THE Grand Canyon of the Colorado river in Arizona has a variable depth, the north wall being somewhat higher than the south wall. The north wall at Bright Angel is about 6000 feet high. The south wall at the same place is about 4700 feet high. The difference is due largely to dip of the formation to the southward, and also to a possible fault. The width of the canyon is from 12 to 20 miles, measured from the upper platform. The Royal Gorge of the Arkansas river in Colorado is about 2000 feet deep. It is cut through granite and gneiss.

\*\*\*\*\*

UNDER a head of 2000 feet, a nozzle of 1 inch diameter will discharge 117.6 cubic feet of water per minute and will develop, if directed on a wheel of proper construction, 378.55 H. P. This calculation assumes that a pipe of proper diameter be used to carry the water to the nozzle, as in a pipe of diameter but little larger than that of the nozzle, the friction would be so great as to greatly reduce the power. A nozzle of 2 inches diameter, under the conditions above stated, will give four times as great a discharge and amount of power as one of 1 inch diameter. The power developed increases as the square of the diameter of the nozzle.

\*\*\*\*\*

THE amount of water required in coarse concentration of mineral, as at some of the Butte, Mont., copper mines, is variable, but ranges from 4000 to 8000 gallons per ton of ore treated. It depends largely upon the character of the ore; those having much clay in the gangue require more water than those where the gangue is clean quartz. In many cases, where there is a scarcity of water, it may be settled in large tanks or ponds and pumped back for re-use with a loss of 20% to 40%, due partly to evaporation and partly to mechanical loss. In figuring on the water consumed in steam making it is customary to allow about 1 cubic foot per hour per horse power. Some plants consume more than this amount, and others considerably less.

\*\*\*\*\*

TIN ORE (cassiterite) was discovered in the Etta mine, near Keystone, in Pennington county, S. D., in 1880. The mine at the time was being worked for mica. The heavy, black minerals attracted attention and samples were sent to competent chemists for determination. The analysis showed the presence of cassiterite, wolframite, columbite and titanite iron ore—all heavy, submetallic, black or dark brown minerals. Besides these, there was abundance of black tourmaline, from small needles to three-sided crystals a foot in diameter; black mica (biotite); muscovite (colorless mica), for which the mine was being worked; white, bluish and beautiful rose quartz; several varieties of feldspar; a small amount of emerald nickel; nickel sulphide; apatite in good-sized crystals, an inch or more in diameter and a foot or more in length, interpenetrating other crystals of feldspar, etc., and crystals of spodumene, mostly of gigantic size, the largest over 50 feet in length and 4 or 5 feet in diameter—a mammoth hexagon. The greater part of the tin-stone occurred in greisen, a rock largely composed of quartz and scales of honey-yellow mica. The mine was aptly described by a geologist and mining engineer, who once visited it, as a kaleidoscope. Tin was discovered at Nigger Hill, in western Lawrence county, S. D., at about the same time in the gold placers.

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THE value of a free gold prospect cannot be judged by counting the "colors" that a pan may be found to contain on washing, without an approximate idea of the value of the colors, and this can only be learned by experience from practical application of some method. If in prospecting gravel in the pan an average of ten colors of nearly uniform size is obtained in each pan and the gravel actually produces \$1 per yard, then the prospector soon learns that ten colors in the pan means \$1 dirt, and he can estimate the value at more or less as the number of colors increase or decrease in the test panning. This is a rude and haphazard method at best and cannot be relied upon to give accurate results. A better way is to carefully weigh each pan taken as a sample, and then weigh the result in gold, when by simple proportion the value per yard is readily estimated. If there is much large rock, boulders, etc., this method is also only an approximation. In prospecting quartz the prospector can much more readily arrive at a reasonable approximation of the value of the ore by practice and by a knowledge of what the rock he samples from day to day actually mills. For years the Homestake Co. at Lead, S. D., employed a sampler whose duty it was to dry, weigh out, crush and pan two-pound samples of ore delivered to him by the mine foreman. A regular system was followed, which made it possible to keep a very close check on the output in free gold monthly. Every sample was marked with the locality from which it came, and after testing the value in free gold, as estimated by the sampler, was written in a book kept for the purpose. The superintendent, by consulting the book, could tell within a few thousand dollars of what the output would be at the end of the month, and directed mining to be done on poorer or higher grade rock as was required to make an even output. About sixty two-pound samples were treated daily. The samples were placed in individual steel pans, dried on a flat

topped furnace, crushed to about one-fourth mesh in a large mortar provided with a pestle and spring pole. From this mortar it was dumped (swinging on trunnions) into a pan, dumped into a second large mortar, above which was arranged an old machine drill provided with a pestle with a large head. This quickly pulverized the sample sufficiently fine to pan without further grinding, when the sampler would carefully but quickly concentrate the gold by washing it in an ordinary steel miner's pan. The outfit was ingeniously and conveniently arranged, and where a large amount of sampling is to be done at a mine it will be found that a machine drill which may have outlived its usefulness in the mine may be sufficiently good for crushing samples for panning, or preliminary to assay. It saves much time and the process is inexpensive.

\*\*\*\*\*

A MINING CLAIM once located, the title vests in the locator or locators, unless by failure to comply with the law, the claim becomes subject to relocation, and is taken by some one else. So long as no second claimant appears to appropriate that which the former locator leaves open to location through his negligence, the title rests in the original locator, but having failed to comply with the law, and another relocates the claim, the original locator loses his right and title in the property. Where A and B together locate a claim and jointly perform the required annual work for several years and then fail for two years or more to do any work, A can not relocate the claim for himself alone as against his co-owner, B. Where several names are placed on a location notice, all of those whose names appear become vested with a legal title to the claim, and the estate so acquired cannot be divested by making a second location leaving out the names of some of the original locators, so long as the first location remains valid and subsisting. If some of those whose names at first appear on the location notice have abandoned or forfeited their rights by failure to live up to the terms of the original agreement under which the claim was located, a relocation may be made by the original co-locator or agent in his own name, but where the location becomes subject to relocation by reason of failure to perform the necessary annual work required by law, the matter is different, for one of several co-locators can not locate the claim for himself alone, and if he does so and performs the necessary work, his only recourse would be to advertise his partner out as provided by law, and to do this it is not necessary to make a relocation. If the partner offers to pay and does pay his share of the assessment work performed, he may retain his interest in the location.

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ALL of the placer gold found in California, as well as elsewhere, was derived originally from quartz veins and other gold-bearing ore deposits in place, but in many instances this gold has been subjected to erosive influences which has resulted in its being re-deposited several times. In the eastern counties of the central portion of California in what is generally recognized as the gold belt, the veins and gold-bearing lodes were first eroded by what are now known as the ancient rivers. In many cases, these ancient rivers have been cut by later, but still ancient, streams, and the gold deposited in the first streams has been freed from that portion of the first stream intersected by the second, and reconcentrated in the latter. In some cases this has occurred a third, and even fourth, time. All of the ancient streams flowed into the great depression (at that time a lake) between the Sierra Nevada and Coast range of mountains. The oldest of the ancient rivers deposited its detritus upon the bedrock (and near it), not only in the stream bed, but also of the great lake. Volcanic eruptions along the crest of the Sierra Nevada, which were contemporaneous with the ancient-river period, resulted in sending vast quantities of volcanic mud and rocks down the ancient streams, covering the previously formed gold-bearing beds of gravel in the beds of the streams. This volcanic detritus was also carried out into the great lake and spread out over the gravel deposits formed in the estuaries formed by the mouths of the rivers where they entered the lake. This process of forming gold-bearing gravel deposits which in time were covered by volcanic mud, sand, ashes and cobbles was repeated a number of times; and although these various geological occurrences are all recognized as occurring during one period of time (the Pliocene), yet they continued through many thousands of years, as demonstrated by the deep erosion of canyons through the previously formed lava-capped gravel beds. In the Mokelumne Hill region in Calaveras county, which may be considered as an epitome of the entire succession of the gravel channel-forming period, the difference in elevation between the latest and oldest gravel channels is not less than 500 feet, while the canyon of the Mokelumne river has been cut down 500 feet lower than the lowest ancient channel. In time the erosion of the mountain on all sides of the great basin or lake filled it and the lake disappeared, the surface of the detritus forming the lands of the San Joaquin and Sacramento valleys. During this ancient river period the Sierra Nevada was slowly rising, and it continues to rise as does the entire Pacific coast of California. This has lifted the valley a few feet above the level of the former lake and has given rise to the minor hills and river terraces which line the streams of the valley. With all the detritus coming down from the mountain streams, both ancient and modern, came a quantity of fine gold, and it is this that now constitutes the value of the dredging claims of the valley.



## Story of the Independence Alleged Salt-ing Case.

Written for the MINING AND SCIENTIFIC PRESS by  
GEO. J. BANCROFT.

Early in January, 1899, I went to Victor, Colo., to take charge of the sampling of what was then known as the Independence mine, belonging solely to W. S. Stratton of Colorado Springs. T. A. Rickard was making the examination on behalf of the Venture Corporation of London, and I took my orders solely from him. This was not the first time I had acted as Mr. Rickard's assistant—in fact, I had sampled at least thirty-five mines with him, or under his direction. Mr. Rickard explained to me that Mr. Stratton had not given an option on the mine, but that V. Z. Reed of Colorado Springs, Colo., had secured from Mr. Stratton a verbal agreement to sell the mine under certain conditions, which at that time were kept secret, and that the examination of the mine was a mutual one, to be conducted jointly by Mr. Stratton's agents and the Venture agents, to determine the condition of the mine and the extent of the ore reserves as a basis for concluding the negotiations. This explanation was brought about by my objecting to taking employees of the mine as helpers in cutting the samples. Mr. Rickard further ex-

plained that the examination was a mutual one, and looked upon the examination as a tiresome performance. This attitude on the part of the officers of the mine did not, however, interfere in any way with the sampling. Mr. Rickard was called to Colorado Springs the night before we began sampling, and, as I saw that the responsibility of the work would unavoidably rest somewhat heavily on my shoulders, I took all possible precautions against any tampering with the samples, not because of any fear that they would be tampered with, but because Mr. Rickard wished me to be able to say when the job was done that no one could have tampered with them, even if they had wanted to. It was a large job and I had felt the size of it keenly, and did not propose to have any flaws in my part of the work. So, in spite of its being a mutual examination, Mr. Rickard arranged for me to have absolute charge of the samples from the time they were cut till they were finally reduced to pulp and divided, one half going to Mr. Stratton's assayer and the other half remaining in my charge till it was delivered to the Wells-Fargo Express Co. for transportation to the assay office of Forbes Rickard at Central City, Colo.

We started in at the first level and sampled only those workings that were known to be in ore. No assay plan of the mine had been kept, and, as a Cripple Creek ore shoot is a difficult thing to locate by sight, we sampled beyond the supposed extent of

surface with Eicholtz or myself and unloaded. The samples were placed in the sampling room. This room had two windows and a door. The door was kept locked with a special Yale lock, of which Eicholtz and myself each had a key. We saw it was kept locked all the time except when Currie or Best were busy reducing samples. The windows were left unlocked, but were carefully sealed by putting several little pieces of string from sash to casement with sealing wax on each end. If any one had wanted to get at our samples, it would have been the most natural thing in the world for him to have opened a window and entered. These sealings were carefully inspected at the end of the examination and found intact.

While sampling was going on underground, Currie and Best were at work reducing them in the sampling room. This room was equipped with a crusher, "coffee mill" and dryer. The samples were dried and crushed to about 3-mesh in the crusher. The larger ones were then parted on a split-shovel once and then the coffee mill was used, reducing them to about 16-mesh. Each one was then mixed on an oil-cloth and reduced on a split-shovel to about a pound weight, when it was mixed and divided on an oilcloth, one-half going into one of the mine envelopes and one-half going into a paper envelope for shipment. These envelopes were packed in candle boxes, and as soon as one was full the cover was nailed on and the box



Taking Sample in the Back of Drift, Stratton's Independence Mine, Cripple Creek, Colo.



Taking Sample in the Face of Drift, Stratton's Independence Mine, Cripple Creek, Colo.

plained that every precaution must be taken to avoid arousing any suspicion that the mine was not being given an absolutely fair test, because Mr. Stratton was only half inclined to sell, and any little friction might upset the deal. Hence it was arranged that one of the officers of the mine should accompany the sampling gang at all times. As assistants I had L. H. Eicholtz Jr., who is now department superintendent at the Western Packing Co.; Walter Best, who was vice-president and general manager of the Northern Coal Co. at the time of his recent death, and Mr. Currie, who is now in South Africa. Mr. Stratton was represented by either James Emerson, the superintendent of the mine, or John Stark, the foreman. Frequently, however, neither of these gentlemen would be with us, because the officers of the mine had no faith whatever that Mr. Stratton would ever sell the mine, and regarded the examination as a useless interruption to the regular work, and additional trouble for themselves, with nothing to justify it. In fact, Mr. Stratton had never wished to sell the mine. As he put it, "The Independence mine is the only thing in my life that has ever stayed by me, and I propose to keep it." Mr. Stratton's plans, however, did not figure on the persuasive tongue of V. Z. Reed. So great was Mr. Reed's power of eloquence and argument that, after it was all over, Mr. Stratton maintained that Reed had hypnotized him and freely offered to trade back, although no one knew better than he that, so far as money went, he had much the best end of it.

It is no wonder, then, that the officers of the mine

the shoots; to be sure we got all the ore, but we did not try to sample the entire lengths of the drifts. Nearly all the samples were taken on the drifts, for the reason that the mine had carried itself and paid for Stratton's many benefactions out of the ore taken from development work, and only when an unusually heavy demand was made on the mine, as when new ground was bought or a lawsuit settled, was stopping resorted to.

The exposure of an ore shoot would be laid out in 10-foot lengths marked with chalk. Then the samplers would start in. Eicholtz and myself watched and assisted in the sampling. Both canvas sheets and boxes were used in sampling. All the samples were cut with hammer and moil. There were four or five men cutting samples. Generally they worked in pairs with a box; but when the vein was narrow and the drift low a sheet was used by each man. Very large samples were taken, the average being about thirty pounds per sample. This was ascertained by keeping count of the number of full cars of "overplus" that was trammed away from the sampling room. As each man or pair of men finished a sample, a clean canvas sack was furnished by myself, and, after sacking, it was given to Eicholtz, who tagged and sealed it. It was then put in an ore car which was pushed along as we went. It was my especial duty to see that each sample was taken fairly and in the right place, and it was Eicholtz's duty to see that each sample was properly booked, tagged and sealed; we both assisted each other, however, in our work. When the car got full it was sent to the

was tied with wire and the wire sealed. It was then taken to Wells-Fargo Express office and shipped to Forbes Rickard.

The final crushing ought to have been finer, as is shown by the variation between the two assayer's returns, but there was only one coffee mill and it could only grind so much per day, and everybody was "pounding us on the back" to get through. Mr. Stratton was very impatient of the delay. He did not altogether approve of "expert" methods and thought we were taking an unnecessarily long time to sample the mine. The sampling underground ran very much ahead of the reducing process, so that toward the last we had several tons of samples stacked up in one end of the sampling room. After Eicholtz and I got through underground each day, we platted the location and width of each sample on the maps of the mine. When we had finished underground we started a night shift on the reducing work and kept at it until it was done.

Walter Best and I then went down and took twenty-five check samples, two or three on each level, at places which we had previously sampled with the men. These samples never left us and there was absolutely no chance that they could have been tampered with. We took them with us to Denver and they were assayed by a Denver assayer. They checked nicely with the samples from the same places taken by the men. From the results of this sampling Mr. Rickard figured there were ore reserves of a gross value of \$6,700,000.

In November and December of last year (1904) I



was commissioned by the executors of Mr. Stratton's estate to conduct a second examination of the Independence mine, which had been ordered by the court, to ascertain if there was anything about the workings of the mine that would have a bearing on the allegations of the plaintiffs in the lawsuit known as Stratton's Independence, Ltd., vs. Tyson S. Dines, et al. Chas. J. Moore, of Denver, Colo., and W. H. Wiley, of Idaho Springs, Colo., were my associates. We found that the mine had produced about \$10,500,000 between that date and time of sale, and that most of the values had come from the ground sampled by Mr. Rickard; that of the 1008 places sampled by him only thirty-five remained unstopped. The balance has all been mined away, in spite of the fact that at least 300 of them were so low grade that Mr. Rickard considered them outside the ore shoots, and had not used them in his calculations. If any considerable part of the values of these samples were "salt," there must have been a lot of mighty low-grade ore mined. The thirty-five places found intact were resampled and the results check nicely with Mr. Rickard's results.

There follows a brief resume of the legal proceedings to date.

It will be remembered that the action was brought by the Venture Co. against the executors of the Stratton estate, and the complainant alleges in brief that Stratton represented the mine to have \$7,000,000 in sight, and to be reasonably worth \$10,000,000, when, in fact, the mine had only \$2,000,000 in sight and was worth only \$4,000,000. The fraud charge is as follows:

Stratton had caused the same to be examined and an estimate made of its value and of the amount disclosed in said property at that time and in making such examinations of the properties the same had not been honestly and fairly done, so as to show the actual value of ore disclosed therein; but the agents and representatives of Stratton, in making the examination, for the purpose of deceiving and defrauding the plaintiff, caused the samples taken from the mine to be salted, so that the estimate of the ore contained in the mine was fraudulently enlarged and the report based thereon was fraudulent and misleading, and that this fraudulent and misleading report was presented to the promoters and organizers of plaintiff company prior to organization and to its officers, agents and directors after organization.

That by reason of the matters set forth in the complaint, the plaintiff had been damaged in the sum of \$6,000,000, for which it asks judgment.

To this defendants made reply by six defences:

First. A general denial.

Second. That Stratton received nothing for the mine but stock. That while in form the transaction resulted in the conveyance by Stratton to the plaintiff corporation of all the mining premises described in the complaint, nevertheless, in truth and in fact, the same constituted but a change in the manner whereby Stratton held ownership and possession of the property.

As to this defence, Judge Riner says in part: "This being an action brought by a corporation, the facts set out in the second defence to my mind constitute a complete defence to this action. \* \* \* Whether what was done was done for the purpose of enabling the company to be passed off as something different from what it was is to my mind wholly immaterial to the present question. The remedy, if any exists, is a remedy of each purchaser of shares, if there were any such, who was deceived by the representations made by his vendor as to the conditions of the company."

Third defence. Denies that the representations set out in the complaint were made by Stratton or any of his agents, and alleges that full and ample opportunity was given to the plaintiff company to examine the mine and inspect the books.

Judge Riner says of this defence in part: "A defence which shows that the purchaser not only did not rely upon the false representations charged against the vendor, but availed himself of the opportunity afforded him to make the fullest examination, and did make such examination, and as a result thereof purchased the property, if supported by proof, raises an effectual bar to the plaintiff's case and is a good defence."

THE VALUE OF THE MINE.—As to the fourth defence, the following is Judge Riner's opinion in full, which covers the ground: "In the fourth defence it is alleged that, even though Stratton made the representations charged in the complaint, there can be no recovery in the case, for the reason that prior to August 1, 1903, the plaintiff had extracted and sold ores from these mining properties of the value of more than \$10,100,000, and, therefore, it has sustained no damage. The plaintiff alleges that Stratton and his agents represented that the mining property had exposed and in sight ore bodies of the value of \$7,000,000, and that the mine was reasonably worth \$10,000,000, whereas, in truth and in fact, the property had exposed and in sight ore bodies of the value of not more than \$2,000,000, and was worth not more than \$4,000,000. I am inclined to concur in the views expressed by counsel for defendants in their brief, that the statement made by Stratton, if it was made, to the effect that the property was worth \$10,000,000, constitutes in law nothing more than the mere expression of opinion, and is not actionable. This, I think, is true from the very na-

ture of the case. Whether or not the statement that there was \$7,000,000 worth of ore in sight was also an expression of opinion or a statement of fact it is not necessary for the court here to decide. Under the allegations of this defence of the answer, I think we may treat it as a statement of fact, and yet the allegations of the answer would constitute a defence, for, as suggested when we were considering the third defence, two things must concur: First, fraudulent or false representations in relation to the condition of the property; and, second, such representations must have constituted the basis of the sale on the part of the purchaser by which he was, in fact, misled to his damage."

The fifth paragraph of the defence alleges that at the time of the commencement of this action the defendants were not, and never have been, executors of the Stratton will; that the will had not been admitted to probate; that letters testamentary had not been issued to the defendants; therefore, that the action was prematurely brought. Judge Riner says in part: "I am led to the conclusion that suit against these defendants could not be maintained prior to their qualification as executors."

It is set forth that Stratton died before this action was brought, and it is insisted that the action does not survive him, and is not good against the executors of the estate.

Judge Riner says in part: "These occurrences must have taken place, if at all, in England, for at that time the company owned no property in this country, and, so far as the pleadings show, had no agent here, nor were any of the officers or directors residing here. This being true, I am inclined to think that the question of the survival of this action must be determined by the laws of England, and that, under the laws of England, the action does not survive."

Judgment was entered for the defendants.

## The Diamond Hitch.

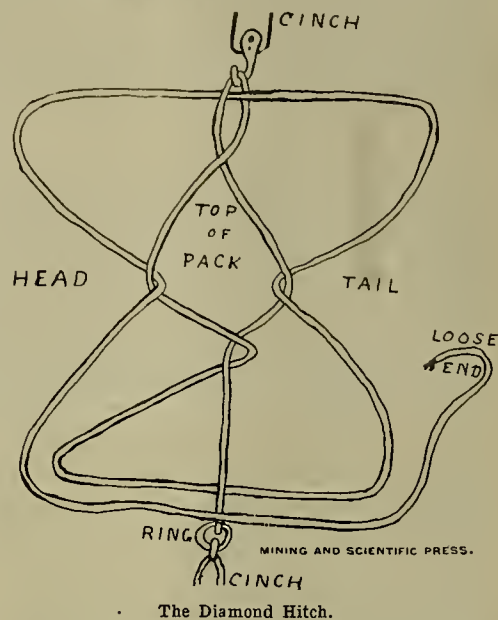
Written for the MINING AND SCIENTIFIC PRESS.

The great interest taken in prospecting the past year and its increasing tendency throughout the West at this time with the coming of summer brings to mind the needs of the prospector who goes into the hills with pack horse or burro. To the uninitiated the packing of an animal for a trip of this kind seems a simple matter, but the writer, speaking from experience, knows that to place a pack on a horse, mule, or even on the humble burro, is no easy task—to secure it so that it will not plunge forward upon the animal's neck or over his head in case of a sharp descent, or ride on his hump in case of a stiff climb, or perhaps still worse, slip around under his belly, when a kicking performance usually follows which scatters the various articles of the pack along the trail or sends them rolling down the mountain side. There is no doubt that the best way to pack an animal in the presence of critics who are profuse with humorous but well-intended suggestions, is to allow them to do the job for you. It will pay to be considered a tenderfoot at the business for the lesson learned and the security afforded the pack, when placed by an experienced old-timer, but as this sort of aid is not always available the new hand should learn to pack for himself. The most famous of all the devices known to packers is the "diamond hitch." It is an ingenious but simple method of securing a pack on an animal. The requisites are a good pack saddle provided with back and breast and straps and a strong rope. Two men are required to pack by this method or any other method where articles are not tied to the various projections of the saddle or carried in bags. In throwing the diamond hitch one of the men is known as the thrower, the other as the cincher, the latter standing on the right side of the animal, the thrower on the near or left side. After the pack saddle has been firmly adjusted and cinched tight the pack is temporarily adjusted and secured to the pack saddle. The thrower then tosses one end of a broad band (similar to a cinch, and provided with a ring at one end and a hook at the other) under the animal's belly, and the cincher catches it by the hook with his left hand. The thrower then tosses the end of the rope backward over the left shoulder of the animal and across his right hip.

The short end of the rope having been securely tied in the ring, the thrower takes the short end, which is secured to the ring, in his left hand and the long end in his right hand and casts a short loop over the back of the animal. The cincher grasps the loop and catches it in the hook, pulling on the long end to draw it taut. At the same time he throws the remaining long end of the rope over the animal's back and toward its head to the thrower. The thrower then draws the rope around the top of the pack, passes it over and under the part of the rope first thrown, then forward around the forward left-hand side of the pack and backward along the lower side of it on the same side toward the rear, around the lower left corner and upward where the rope is passed beneath that first thrown. From there it passes around the upper right-hand corner, downward under the lower rearward right-hand corner

and along beneath the right side around the forward corner on that side, passing from thence upward around the upper forward right-hand corner where a second loop is made with the rope already in place, then downward on the left side beneath the lower left-hand forward corner of the pack and backward again to the rear, when the loose end must be securely fastened in the diamond formed by the rope at the top of the pack. The rope must be kept tight throughout the entire process and after passing the first loop must be tightly drawn.

The accompanying sketch will help to understand



The Diamond Hitch.

the manner of throwing the diamond hitch and its purpose. The only difference in the methods of different packers is that some start toward the rear end and some toward the forward end, but the result is the same. Considerable care and experience are required to get the pack secured by drawing the ropes as tight as possible. Pack animals soon become trained, and will deceive an inexperienced packer by holding their breath and swelling up until the pack is made fast, when they exhaust the excess air from their lungs and the entire pack is loosened.

## Topographic Maps of Colorado Quadrangles.

Maps of two interesting quadrangles, one of Ouray, Colo., and vicinity, and the other of the Needle mountains, in the same State, are now ready for distribution. Each represents a rectangular area approximately 14 miles east and west and 17 miles north and south in extent. The Ouray quadrangle lies directly north and the Needle mountains quadrangle directly south of the Silverton quadrangle.

The Ouray quadrangle lies partly in Hinsdale and partly in Gunnison counties and covers about 20 miles of the valley of the Uncompahgre river, all of Cow creek (Rio de las Vegas), and the headwaters of the middle and west forks of Cimarron creek. The mountains shown on the map include nearly all of the higher ranges between Mount Sneffels (14,150 feet) and Uncompahgre Peak (14,300 feet), among them Whitehouse mountain (13,496) and Wetterhorn Peak (14,020). Those rising along the eastern ridge of the quadrangle range from 12,000 feet to 14,000 feet above sea level and are unnamed.

The only important town or settlement in the quadrangle is Ouray, a city of 2500 inhabitants. Other postoffices in the quadrangle are Dallas and Ash. Ouray, which is widely known as a gold and silver mining camp, produces a daily output of gold alone approximating \$10,000 during a large part of the year. Among the mines tributary to this town is the Camp Bird mine.

East of Ouray lies a vast arena, 1½ mile in diameter and 1 mile in vertical depth, called "The Amphitheater," which is surrounded by volcanic walls that make it well-nigh inaccessible. Farther southwest Canyon creek enters Ouray through a box canyon so deep and narrow that it is said sunlight never enters there. Trails have been blasted in the quartzite walls and a portion of the canyon has been tunneled, so that the visitor may inspect the dark recesses.

The Needle mountains quadrangle is divided into two nearly equal parts by the San Juan and La Plata county boundary line. The Continental divide cuts across the northeast corner at the headwaters of the Rio Grande river. The largest stream shown on the map is the Rio de las Animas Perdidas, which flows for many miles through one of the deepest valleys in the United States. To it are tributary Vallecito and Needle creeks and Florida river. The Needle mountains and West Needle mountains, shown on this map, rise more than 14,000 feet above sea level and are among the roughest in the world and the



highest in the United States. Between them flows the Animas river, along which extends the Silverton branch of the Denver & Rio Grande Railroad. Needleton is the only postoffice in the quadrangle. There are no settlements, and the permanent population of the entire area is less than a dozen.

The head of Needle creek, in the Needle mountains, has recently been extensively prospected for gold and silver. The forest, extending down the slopes from timber line, which here lies at an altitude of about 12,000 feet, is of spruce, intermixed at 10,000 feet with quaking aspen, to which pine is added at 9000 feet, while cottonwood and other timber trees are found at lower levels.

The price of these maps is 5 cents each. They may be obtained on application to the Director of the United States Geological Survey, Washington, D. C.

### Artesian Water.

In many districts, particularly in some of the basins of the more arid portions of the West, there are possibilities for obtaining water by means of drilled wells. It is useless to hope for artesian water where the rocks are old, crystalline schists, granite or intrusive dike rocks, but in some regions where there are large accumulations of volcanic materials—tuffs, mud flows, etc., which occupy a basin or depression, there is sometimes the possibility of obtaining flowing water by boring. Unaltered sedimentary rocks—sandstones, shales, grits, etc.—offer the best opportunities for obtaining water by the comparatively inexpensive means, from great depth. The probability of obtaining water by boring should be looked into by a competent stratigraphical geologist before much money is expended in this direction, for many holes have been drilled through ignorance of the primary principles governing the obtaining of artesian water, where there was not the slightest hope of securing a flow. Pumping water may often be obtained in comparatively small amount by boring in crystalline rocks, but never a flow.

In a general way the geological conditions essential to the securing of artesian water are a stratum of comparatively open or porous rock, like sandstone, grit or conglomerate, in which there are abundant small open spaces which may be filled with water. This stratum must be overlaid by an impervious stratum like a close shale or bed of clay. The word impervious, as here used, is only a relative term, as no rock is absolutely impervious to water. What overlies the impervious stratum is immaterial. These strata should lie in a low monocline, or in a synclinal fold, the higher end or ends of the fold coming to the surface, in order that the rain waters may seep downward into the stratum. This stratum being penetrated by the borehole at a distance from the outcrop, the water, unable to rise through the overlying impervious layer, rises through the borehole. The accompanying illustrations show a variety of conditions under which wells bored for artesian water prove successful, or, for geological causes, fail of the purpose.

The following on the subject of artesian water, by I. C. Russell of the United States Geological Survey, is of interest to all who are interested in this important subject:

As the water supply in an artesian basin may become of importance to a large number of citizens, it is obvious that laws governing its use are as necessary as the laws relating to surface waters, but, so far as known, only one attempt to place legal restrictions on the utilization, or rather on the waste, of subsurface waters have been made in this country, and that act falls in two particulars to meet the requirements outlined above—the proper casing of wells is not made obligatory, and the filling of abandoned wells is not provided for. Each of these regulations is highly important.

The principal restrictions and conditions which it is desirable should be established and enforced by law are as follows:

1. Every drill hole in an artesian basin should be properly cased. By this is meant that an iron casing or tube lining the hole and made sufficiently tight to prevent water from rising outside of it should be put in every well which remains open. The lower end of casing should be just above the water bearing stratum.

The reason why the owner of a well should be required by law to properly case it, as already explained in reference to the personal interest of the owner himself, is that lateral escape of the water may be prevented. The escape of water from an artesian basin in excess of the natural overflow means a decrease in pressure on the portions remaining, and consequently a lowering of the artesian head. In arid regions especially the sources of supply of an artesian basin may be small, and the question of economically using the water it contains and of maintaining the artesian head are matters of public concern.

2. Every artesian well when not in use should be securely closed. The reason why a law to this effect should be enacted and enforced is that an artesian basin is not an inexhaustible reservoir, and every practicable means should be employed for its conservation and legitimate use. The closing of an artesian well when its water is not being used would in many and perhaps most instances be an advantage to its owner as well as to his neighbors, not only for the reason that his water supply would be made more permanent, but because

water flowing over land in excess of the amount required for scientific irrigation is injurious.

There are exceptional cases in which it is not desirable that an artesian well should be closed at any time, as, for example, when a well is no more than a developed spring, or derives its water from what is known as an artesian slope,\* but as such wells will probably be few in number in the artesian basins, special legislation in reference to them is perhaps not desirable.

3. Every abandoned drill hole in an artesian basin should be completely filled with impervious material. A desirable way in which to do this is to fill the hole slowly with moist clay and ram it down with a heavy, blunt tool, or fill the hole with Portland cement concrete. Tightly fitting rods of dry wood driven into a drill hole until it is filled would serve the same purpose.

Abandoned wells should be filled in the manner suggested in order that leakage may be prevented. Wells in which water rises some distance toward the surface, but does not overflow, are frequently abandoned, the casing, if any was used, having first been drawn, and in such instances a continuous escape of water occurs into cracks, porous beds, etc., about the hole.

The three rules briefly stated above should be embodied in the laws of every State in which artesian basins occur and their observance should be rigorously enforced.

For the proper development of an artesian basin it is evident that there should be but one center of responsibility. A desirable method of securing this end would be to place the entire control of the artesian wells in each State in the hands of a State engineer, whose duty it should be to determine where wells may be drilled, the

possible, depending upon the results of erosion of the upturned strata.

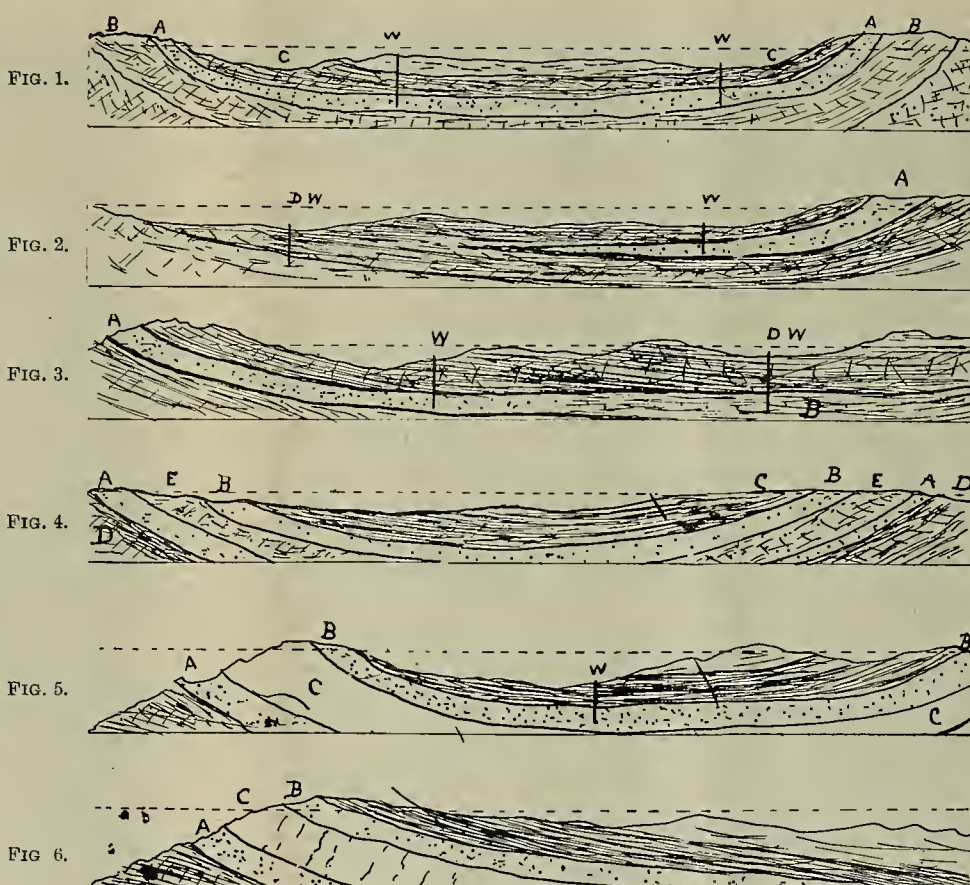
Fig. 5 illustrates the possible effect of erosion. A and B will result in producing flowing wells wherever penetrated by the well bore, providing the stratum C between them is not fissured and porous.

Fig. 6 shows how a condition similar to that in Fig. 5 may be disturbed by the shattering of the rock in the stratum C, resulting in the water contained in B flowing downward through the fissures in C into A, and thus draining B. A well sunk to B would under such conditions fail to flow, and if the bore were continued to A no flow would result above the outlet of the stratum at A.

In addition to these simple conditions are many others which may have a direct effect on the amount of water obtainable. When wells are sunk in porous water-bearing strata the surface exposure of these strata may be many miles distant. Often the water-bearing stratum contains minerals in solution, which render it unfit for use. The remedy, if there be one, is to bore deeper, though this is not always satisfactory.

### Water Supply by Compressed Air.

The water supply of Los Angeles, California, has in the past been received by gravity, only a few higher parts of the city being supplied by pumping



depth to which they may be carried, and methods for caring for the water supply, closing abandoned drill holes, etc.

While, in the majority of cases, good results may reasonably be expected from the judicious development of the artesian basins, all the benefits that might be derived in that way will be rendered negative unless the suggestions given above in reference to the conservation of the water supply are strictly observed. I may perhaps add as a warning that the wanton destruction of the forests in this country and the now almost complete ruin of the public grazing lands throughout the arid regions leave but little hope that man's greed will be so far restricted in the case of artesian basins that ultimate failures will be avoided.

Fig. 1 shows an ideal section, illustrating the main requisite conditions of artesian wells. A is a porous stratum, B and C are impervious beds below and above A. F is the height of water level in the porous bed A. W—W' are flowing artesian wells, springing from the water-filled stratum A.

Fig. 2 illustrates the thinning out of a porous, water bearing stratum between impervious strata. W is a flowing well having its source in A. DW is a dry well, which is sunk deeper than W, but for the reason indicated there is no flow.

Fig. 3 illustrates a porous stratum A changing to a dense, impervious one at B. W is a flowing well and DW is a dry well, there being little or no water in the stratum at B.

Fig. 4 shows the usual manner in which strata reach the surface. A and B are porous beds; C and D are impervious beds, and E is a semi-porous bed between A and B. B at one end is lower than at the other, and also lower than A. Many variations are

into the mains. The growth of the city, however, has made an additional supply necessary and a pumping plant is to be installed in the southwestern part of the city near Slauson Junction, where wells have been bored to water bearing strata 60 to 200 feet below the surface, these wells to be operated by compressed air. The system adopted is the air lift, in which compressed air is forced through one pipe down to the bottom of the well, where it discharges under the mouth of another pipe reaching to the top of the well and emptying into the reservoir. The bubbles of air issuing from the first pipe enter the mouth of the second, but do not fill it completely, as a considerable amount of water is carried in between the bubbles. The weight of water within the second pipe is thus less than that in an equal cross section of the well exterior to the pipe. The pressure of the water in the well, therefore, is greater and forces the mixture of air and water in the pipe to rise constantly, and as the bubbles of air are continually supplied at the bottom, this process goes on without intermission, the mixture of air and water discharging at the top of the well in a practically constant stream. The air, as it rises toward the top, expands, thereby returning the work which was expended in its compression, and as in expansion the temperature of air is greatly reduced, it serves at the same time to cool the water.

The twelve wells will discharge into a common reservoir, from which the water will be forced by a pumping engine into the city water mains. The water in the wells at present stands about 60 feet below the surface, but, as has been found in irrigation work in California, the ground level of subter-



anean water supplies is apt to be lowered considerably by continuous pumping, and the compressor has therefore been designed to pump, if necessary, from a lower level, being guaranteed to deliver 2000 cubic feet of air per minute against a pressure of 100 pounds. The compressor will be installed by the Baker Iron Works, of Los Angeles, who are local agents of the Laidlaw-Dunn-Gordon Co.

The Los Angeles machine will be of the two-stage type, the air partly compressed in a large cylinder, after which it will pass through a cooler, where its temperature will be reduced by passing over tubes containing cold water, to a high pressure cylinder, where the compression will be completed. The steam engine driving the compressor and forming, in reality, a part of it, the steam cylinders working on the same piston rods, is also compounded, the steam expanding first in a high pressure cylinder, after which it passes to a receiver, where it is dried and reheated by high pressure steam in pipes, after which it finishes its expansion in the low pressure cylinder. The steam is then condensed in a surface condenser and returned to the boiler through reheaters by the boiler feed pumps.

### Stave Pipes for Conveying Water.\*

Written for the MINING AND SCIENTIFIC PRESS.

The use of wooden pipe for conduits and pressure mains has increased rapidly during the past few years, and the box flume and ditch are fast giving way to this more economical method of conveying water. Among the most notable examples of stave pipe installed during the past season is that of the Washington & Oregon Power Co. on the South Fork of the Walla Walla river, in northeastern Oregon, in connection with their hydro-electric power plant.

This conduit conveys the water from the headworks of the system to the receiving reservoir situated some 5½ miles distant.

The one feature of the work which gives the structure especial prominence in the list of difficult undertakings is the alignment and the topography of the country which made this alignment necessary. The whole region lying on the westerly slope of the Blue mountains is covered by an immense lava cap, and it is through this that the Walla Walla river has cut its channel, leaving the marks of its centuries of labor in the perpendicular cliffs which mark the boundaries of the canyon.

It was along the south wall of this gorge that the line was located. A uniform gradient of 17½ feet per mile was used, and as the average gradient of the stream is 80 feet per mile there was a net gain in elevation of 62½ feet per mile.

The receiving reservoir is situated on a smooth hillside at the mouth of the gorge, and from this reservoir the water is delivered to the Pelton water wheels under a head of 350 feet.

Curvature was limited to a minimum radius of 200 feet, but no limit to total angle was fixed. The original location showed 90% of the entire line on curves, and of this over 50% was sharper than 250 feet radius. The remaining 10% was located as tangent, but as it was largely in very short sections, from 5 feet to 10 feet, it almost entirely disappeared in the construction.

The foundations consisted of a combination of bench blasted out of the solid rock, bench and cripple bent trestles, and full trestles where the limit of curvature would not permit of the other forms. Where the full bench was used cross ties of 4x6 inches were placed and on these the pipe rested. The pipe was further supported by cradle blocks, consisting of 4x6-inch blocks, cut to fit the outside circle of the pipe. These were driven under the pipe on top of the cross ties on both bench and trestle until a perfect bearing was had, and then the block toe-nailed to the tie. This gave support to about one-fourth of the entire circumference of the pipe.

At five different points along the line deep narrow side canyons entered the main canyon. These were too deep to cross at grade. At these points inverted siphons were introduced into the line. In these the pressures varied from 20 feet to 170 feet, and the maximum curvature, both horizontal and vertical, was used.

The pipe was built by the National Wood Pipe Co. of Los Angeles and San Francisco, Cal., owners of the Wheeler patent, under which it was constructed. The staves for the pipe were cut from 2x6-inch yellow fir and kiln dried. They were provided with a horizontal slot in each end to receive the oak tongue used for butt joint connection. These tongues were made 3 inches in length measured with the grain, and were provided with a small bead about ⅛-inch in all dimensions along the center of each end grain. In width across the grain they slightly exceeded the width of stave at the slot, this excess being embedded in the adjacent stave by cinching.

The hands were round mild steel, having a tensile strength of from 58,000 to 68,000 pounds, ½-inch in diameter, except for pressures over 100 feet, where those having ⅝-inch diameter were used. Each end of the band was provided with a rolled thread 5 inches

long, a hexagon nut and No. 12 gauge steel washer.

The shoes or lugs for connecting the bands were malleable iron and of such design as to permit free access to each nut in cinching, and still give perfect support to the staves without flattening the pipe.

The material was delivered at Milton station on the O. R. & N. Co.'s railroad, and from there hauled by the power company's teams 10 miles to the site of the work.

The line being from 20 to 350 feet above the valley, and on an almost perpendicular bluff, the task of delivering material to the work was no easy matter. For this purpose double drum hoisting engines were employed, using a heavy steel cable for a trolley, and a carrier operated by hoist and back haul cable. An average of 400 feet (board measure) of lumber or 1000 pounds of metal were hoisted each load. When the material was deposited on the grade it was loaded on hand trucks and distributed along the line, an average trucking haul of 2000 feet being found economical.

The work of construction was attended with many difficulties, both in actual erection of the pipe and in providing for the safety of the workmen. A very large percentage of the line was on trestle foundation, which made the work of curving the pipe extremely difficult, as the character of the bluffs made it impossible to brace the trestles against the strains imposed by curving the pipe. It was often necessary to drive gads into the rock and anchor the trestle by means of a chain and "twister" until the pipe was in place and cinched. In curving the pipe away from the bluff ordinary screw jacks were employed, a saddle cut to fit the outside of the pipe being used to jack against, this preventing flattening. When necessary to curve the pipe toward the bluff, chain blocks of one ton capacity were used, making fast to the bluff by means of a gad driven into the rock and to the pipe by a chain sling. In this case it was necessary to put a strut inside the pipe to prevent crushing. The chain blocks were left in place until the section was driven and firmly cinched, after which it would remain in position, then the whole operation would be repeated.

These operations on trestles, themselves 60 to 70 feet high, and in places where a misstep meant a fall of from 100 to 250 feet, made the utmost caution on the part of the workmen necessary. In the whole life of the contract there was no accident of any kind to workmen. Work was begun July 14, 1904, and the line completed December 31, 1904, sufficiently to permit the turning in of the water. On December 16th, after allowing the pipe sufficient time to swell, the necessary repairs were made which required three men one and one-half day's time. On the completion of these repairs the final certificate of completion and acceptance was issued by the engineer of the power company.

The plant was designed by Samuel Storrer, consulting engineer of Los Angeles, Cal., and was in charge of F. S. Badger, resident engineer. J. L. Stannard, engineer of the National Wood Pipe Co., was in charge of the work for the contractor.

### Shot Firers in Mines.

The proposal to legislate on shot firers in the mines of Illinois has led to the following printed argument from the standpoint of the miners:

To the Members of the Forty-fourth General Assembly Favoring Law for Shot Firing where Coal is Blasted as per Provisions of Senate Bill No. 18.

According to the reports made by the several mine inspectors to the Bureau of Labor for the year 1904, there were 157 men killed and 507 received injuries more or less serious.

A classification of fatal accidents by causes shows that 50% are directly occasioned by the use of powder. Desiring to reduce to a minimum the number of accidents resulting from this cause, we favor the enactment of a law similar in its provisions to that of Senate Bill No. 18, providing for the employment by the coal companies of the State, and at their expense, practical men whose duties it would be to discharge shots in all mines where coal is blasted off the solid, or where more than two pounds of powder is used in any one shot.

In support of a law of this character the following brief arguments and facts are submitted:

It is not alone the excessive number of fatal accidents which have and are now occurring, but the possibility of a frightful catastrophe, which under certain conditions is liable to happen at any time, that urge us to advocate this precautionary measure. The force of exploding powder, united with the dust necessarily created, occurring from so-called "windy shots" is great enough to wreck a coal plant, destroying not only the stoppings and other contrivances for directing the air currents in the mine, but even extending to the main or escape-ment shafts and disabling the ventilating machinery on the surface. An explosion of this kind recently occurred not many miles from the State capital in which several men were killed. Fortunately it happened at a time when but few men were at work, otherwise the loss of human life would have been great indeed. The chief object of the proposed measure is to prohibit shooting during the time the

miners are employed, and it requires no argument to prove that under this plan only the lives of the shot firers would be exposed, and their number would not exceed six or eight in the most productive mines in the State. These men would be familiar with mining operations, including the use and power of explosives, and as they have the authority, under the proposed bill, to refuse to discharge any blast that in their judgment would be dangerous to be exploded, the means of safety would be largely under their own control. Another evident point in favor of this plan is that it would educate miners, many of whom are impractical and some illiterate, in the proper use of explosives and in the general work of preparing shots. Under this plan the miner who drilled a "dead hole," that is, a hole drilled on the solid, or otherwise located in such a manner that the powder had no chance to perform the work expected of it, would be punished in the most effective way by having no coal to load the following day. One of the main objections, probably, that the employers would make would be that requiring them to pay for the services of shot firers. Under the present practice, recognized by the district agreement made between the operators and miners, is that of general shooting at or near the end of the day's work. The time of beginning shooting is anywhere from fifteen to thirty minutes before the expiration of the eight hours' work.

### The Nickel Mines of Ontario, Canada.\*

Written by W. E. H. CARTER.

A great deal has been written on the nickel areas surrounding Sudbury, Ont. There have been latterly but two operators in the field, the Canadian Copper Co., subsidiary to the International Nickel Co., and the Mond Nickel Co. The operations of the former far exceed all others in the business, both in the mining and smelting departments, and are even now being enlarged, while Dr. Mond's works have closed down for the present, with a large stock of matte on hand.

The old Copper Cliff mine of the Canadian Copper Co., still the richest in copper of any in the district, has produced latterly about 1000 tons per month from the bottom levels, at between 1000 feet and 1100 feet in depth. The ore has there broken up into irregular hodies, making diamond drilling necessary at their location. Another substantial shoot of ore was recently found in this way and is now being mined. The ore averages about 12% combined metallic content—10% copper and 2% nickel.

No. 2 mine holds good as ever in the bottom levels, at about 400 feet depth, the ore averaging about 3% nickel and 2% copper. The now abandoned open pit, measuring 217 feet in depth, with an average diameter of about 120 feet and nearly vertical walls, far exceeds in size any other of these open workings at the present time. The mine is in shape to produce 400 tons of ore per day with its one shaft.

Mines Nos. 3, 4 and 5 and the Stobie are in shape to produce in large quantities when that particular class of ore in each becomes needed at the smelter.

The output of ore for a while back has come chiefly from the Creighton mine, the present rate of mining there giving over 800 tons per day. The main unbroken ore body contains, by estimate from diamond drill exploration, over 3,000,000 tons of ore of a 6.5% nickel-copper content—about 2 of nickel to 1 of copper. There are extensions to this ore body which will considerably increase the total quantity. This estimate accounts for the ore body to a depth of but 300 feet, this being the maximum vertical depth bored by the drill, at which the depth of the deposit was about 225 feet.

In order to economize in the roasting and smelting operations the entire surface works have been rearranged, not at once but gradually during the past two years, and now a new or third smelter plant is about completed to replace both the others and also the Ontario Smelting Works, near by, where the low-grade matte is at present partially refined. There will be only two blast furnaces, but they will have a combined capacity of at least 1100 tons of charge per day, and from them the molten matte will run direct to the bessemer converters in the same building and be raised to a content of about 80% nickel-copper. The accessory plant, the buildings and the new power generating station and the general arrangement are after the most approved ideas.

With the completion of the new works all ore will be roasted in the new yard. This covers a distance of a mile or so from end to end, with heaps piled two deep and close together. Instead of the old dimensions of 40 feet by 80 feet plan by 10 feet high, the size of the heap has been reduced to about 25 by 40 feet plan by 6 feet high, with the expectation that it will roast better and in about one-third the time—that is, in from one to one and a half months.

The Victoria nickel mine before closing down reached a depth of 500 feet, after which diamond drill holes were bored from the bottom and from two stopes on either side of the shaft, and the ore found to continue down to greater depths. Since the com-

\*See illustrations on front page.

\*Abstract Trans. Can. Min. Inst.



mencement of smelting at the company's plant near the mine over 5000 tons of bessemerized matte, containing about 80% combined nickel and copper, has been produced. But only a part of this has so far been refined into the pure metals at the company's refining works in Wales. The Mond Nickel Co. mined and raised ore from the North Star mine during the past two years, shipping the same to its furnaces at Victoria.

All other mining on the nickel range has latterly been curtailed to exploring for other ore bodies, the work no longer limited to the vicinity of the Sudbury area, but reaching out to the boundaries of the field.

### Shaft Bins at Lake View Consols, Kalgoorlie, West Australia.

Written for the MINING AND SCIENTIFIC PRESS by D. E. BIGELOW.

The shaft has three compartments, two of which are for the double winder and the third is for sinking and as ladder and pipe way. The shaft is now 1900 feet deep and sinking is still under way.

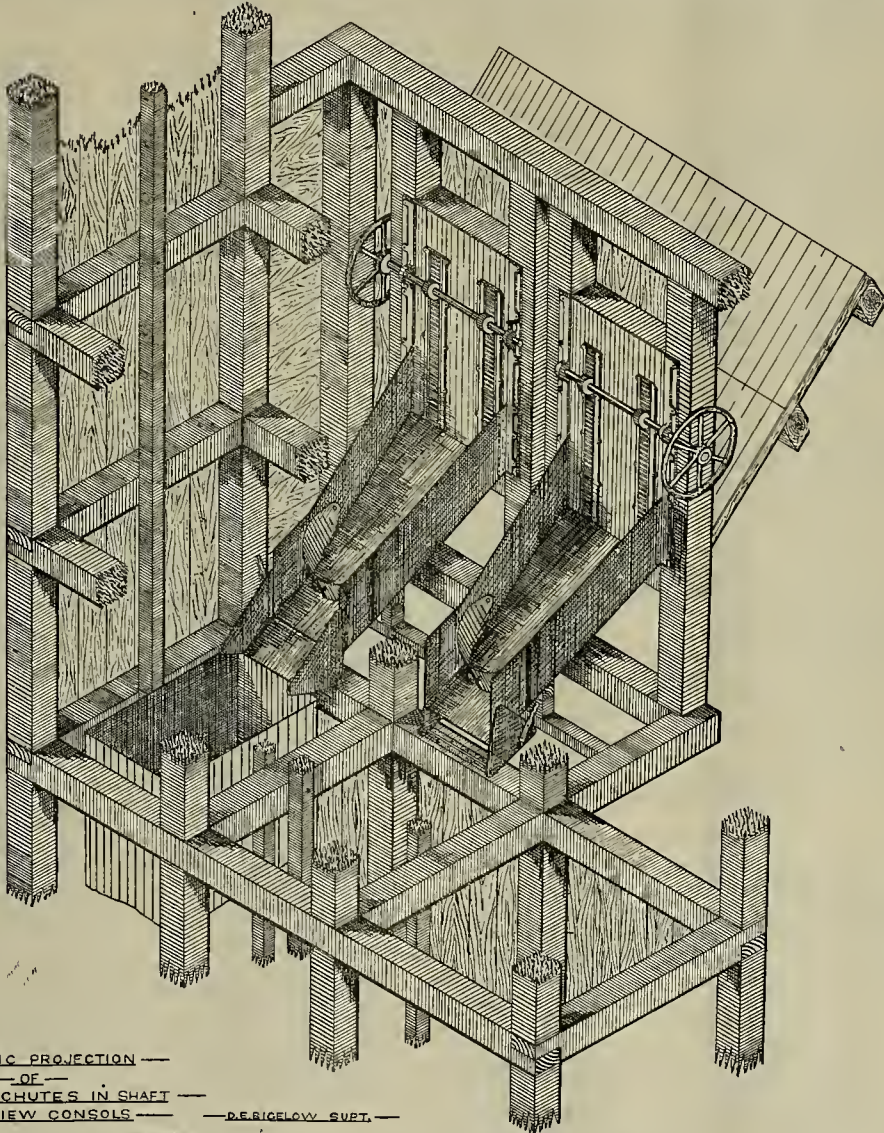
A year ago it was decided to substitute skips for cages, and, to accommodate the former, ore bins

the gates and chutes were set and the bin bottom lined with steel plates. The bin posts were set 3½ feet in the clear from the shaft sets, allowing plenty of room for the skip tender.

Next the raise was enlarged enough to give storage for about 100 tons of ore. The gates are 28 inches wide in the clear and provided with double racks, so that bulging from pressure of ore does not bind the gear. The chutes are ¼-inch steel plates riveted to angle iron corners.

A very important detail is the design of the tail chutes for carrying the ore directly into the skips. These are so arranged that their own weight holds them in position forward or back as placed. After being used for filling, as shown in the farther compartment in the drawing, the ascending skip knocks the chute back clear of the shaft, as in the near compartment.

Another feature is the auxiliary swiveling gate in the chute, used to control the stream of ore should the upper gate fail by any chance. The auxiliary gate is simply a ¼-inch plate, bent as shown and swung on bolts to the sides of the chutes. While the ore is passing, the gate is swung as an arch spanning the chute and may be dropped quickly to hold back the ore, if required, as in case the upper gate is



were cut under the plats, and loading stations and chutes put in one side of the shaft, 30 feet below the plats at four different levels, from which the greater part of the ore was to be drawn.

In putting in the bins no interference with regular work in the shaft was to be tolerated, which condition added materially to the cost of the work.

The mode of procedure was as follows: The ladder compartment was planked over on the set, shown in the drawing, and partitioned off from the others up to the level above. This prevented stuff falling into the shaft, and gave protection to workmen in this compartment. The lagging was then withdrawn on one side a height of two sets in this compartment and cutting for the station begun. The dirt was raised by hand windlass to the plat above and loaded into trucks to be hoisted to the surface.

The station was cut the whole width of the shaft without removing the lagging from the two winding compartments, to a height of 2½ sets, and back on the incline to suit the bottom of the bin. All the dirt possible was left against the lagging, as protection against firing. Drilling was all hand work until after the first cut in the raise. The raise was carried up from the back of the station to the plat, 4x6 feet in size, using machine drills. After breaking through,

fouled or partially closed by a large stone. This arrangement gives as much security against losing ore down the shaft as the more expensive charging bin arrangement, and requires much less room.

The cost complete—all labor and material and general expenses—was as follows:

Labor and salaries.....	£	s.	d.
Explosives.....	183	13	10
Timber.....	29	19	0
Candles.....	9	8	1
Steel.....	4	10	0
Sundry stores.....	0	19	9
Power.....	3	0	0
Repairs and maintenance.....	40	10	11
General expenses.....	7	19	0
Pumping.....	13	14	2
Assaying.....	2	9	3
Assaying.....	1	16	0
Total.....	298	0	6
Total shifts worked.....	257		
Miners.....	190		
Shovelers, etc.....	21		
Timbermen, etc.....	21		
Total feet of raising (incline).....	86		
Cost per foot, all expense.....	40		
	27	8	9d

THE Michigan College of Mines will hold its second annual class-day exercises in Houghton and Hancock, Mich., on May 5. A feature of the event will be the public address by W. G. Mather of Cleveland, Ohio.

### Mining on Gribble Island, B. C.

Written for the MINING AND SCIENTIFIC PRESS by W. M. BREWER.

It is necessary to travel up the coast of British Columbia to fully appreciate the immensity of the province, the great length of coast line, and the enormous areas covered by the numerous islands which are situated not only in the Pacific ocean proper, at variable distances from the mainland, but also in the many sounds, bays and inlets which penetrate for miles into the interior.

GEOGRAPHY.—Gribble and Princess Royal islands, on which are located mineral claims that have been in course of development for the past four or five years, are situated near the mouth of the Kitimat river, and are separated from each other by a narrow channel known as McKay reach. From Princess Royal island several shipments of gold-bearing ore of unusually high grade have been made to the smelters on Vancouver island and at Tacoma since 1902. This property is being rapidly developed into a mine which promises profitable results for the operations. It is situated on the westerly side of the island, and until recently has been the only prospect on which development work has been carried on, but at present a party of prospectors from Bellingham, Wash., are opening a prospect on the opposite side of the island, close to the beach.

On Gribble island two companies organized in Bellingham, Wash., have been carrying on operations for the past few years on the west side of the island, and within about 1 mile of each other.

The property on which the most development work has been done consists of ten claims owned by the Canadian-American Mining Co. The other, consisting of several claims, is owned by the Gribble Island Mining Co.

GEOLOGY.—Owing to the snow which had fallen a few days previous to the arrival of the writer at Gribble island, examinations of the surface were made with difficulty. The underground workings, however, which have been opened permitted a fairly accurate survey of the geology on that side of the island.

The similarity of the geological formations on Gribble island when compared with that on Texada island, nearly 400 miles to the southeast, or at White Horse, in the Yukon Territory, is striking, especially with regard to the occurrence and character of the ore bodies, but the geology cannot be said to be exactly similar, for on Gribble island the granitoid rocks, especially in the vicinity of the ore bodies, have a decided gneissic structure, a feature entirely absent in the other two districts mentioned.

Another dissimilarity is in the fact that, so far as at present exposed, the ore bodies, instead of occurring at the contact of crystalline limestone and igneous rocks, as is the case both at White Horse and on Texada island, are found between a gneissic granitoid foot wall and a diorite hanging wall. But with regard to the hanging wall, this is merely a conjecture based on conditions of the outcrop, and not from underground exposures, because sufficient crosscutting has not been done in any place to determine either the character of the hanging wall or the width of the main ore body.

A well-defined diorite dike is noticeable on the beach at the landing place used by the Canadian-American Mining Co. The dike, according to reliable information, forms a prominent landmark through the island. Its average width is 12 feet and its line of strike north 20° east. On the easterly side no occurrence of minerals has yet been discovered.

The country rock on the westerly side of the diorite dike referred to has always been classed as granite, but a close examination with an ordinary lens caused the writer to form the opinion that this rock is composed of hornblende and orthoclase feldspar, and it should, therefore, be classed as syenite. A noticeable feature connected with it is observed in a tunnel 600 feet in length, which has been driven for the purpose of intersecting the ore body which outcrops on the surface. This feature is the change of structure and grain of the rock from a coarse grain near the mouth, with well-defined, large crystals, to a fine-grained rock near the ore bodies, with gneissic structure, evidently a syenite gneiss, because, so far as can be observed with the lens, it is composed of the same hornblende and feldspar, and apparently having no other minerals associated with these.

CHARACTERISTICS OF ORE BODY.—The ore body itself, so far as it has been exposed by open cuts on the outcrop—a tunnel and shaft—is a mass of considerable extent made up of crystals of variable size of bornite scattered through a matrix of garnetite and feldspar, the latter occurring in particularly large crystals of a pinkish color. Much of the garnetite is made up of large sized garnets almost perfect in their crystallization and of great beauty.

There is one peculiarity with regard to the foot wall of this ore body, which is that it resembles sandstone for about 1 foot in thickness, and in this can be seen grains of chalcopryite, but whether in sufficient quantity to give it commercial value is doubtful.

There is considerable epidote associated with the other minerals which make up the matrix.

Southerly from where the main outcrop has been



exposed by an open cut there occurs a steep bluff which has the appearance of being a continuation of the outcrop capping an ore body, but no work has been done to establish this fact.

**DEVELOPMENT.**—The development on this property consists of open cuts made on the outcrop, a short tunnel 40 feet below the outcrop, which was probably started with the intention of crosscutting the ore body, but was merely run until at the face about 3 feet of ore was exposed, when a shaft was started and sunk 37 feet in ore. At that depth the water interfered, and having no pump it was concluded by the management to drive a crosscut tunnel starting from a point 200 feet lower than the short tunnel referred to. At the time of the writer's visit this tunnel had been driven 600 feet, but had not yet intersected the ore body on which the shaft had been sunk.

At 425 feet from the mouth of this tunnel a lens of ore has been crosscut and drifted on for 30 feet. The ledge matter in this is made up of the same minerals as are found in the main ore body, that is to say, large crystals of feldspar, garnets and some epidote, with masses and crystals of bornite of variable size as impregnations, distributed variably through the matrix. If properly sorted, this ledge should carry good commercial value, but under present conditions with regard to freight rates the material would not pay to ship unless carefully sorted.

The line of strike of this ore body is almost parallel to that which outcrops higher up the mountain, nearly due north, but the dip is at an angle of 60° west, while that of the main ore body above is 65° east.

From a survey of the long crosscut tunnel it will be necessary to continue it for probably 100 feet, and also turn its course northerly in order that a raise may connect with the shaft referred to and the conditions of the ore body determined below the bottom of that shaft.

Judging from the extent of the outcrop, the fact that the shaft has been sunk 37 feet all in ore, and the continuity of the outcrop towards the north along the line of strike of the main ore body, it appears as though this property, if development is continued on the proper lines, should in the near future be placed in a position to ship ore. The tonnage, of course, would depend largely on the cost for transportation and the necessity for more or less sorting.

From the appearance of the dumps which have been accumulated, the writer is of the opinion that it will be found more profitable to consider the ore bodies as low-grade propositions rather than to attempt sorting.

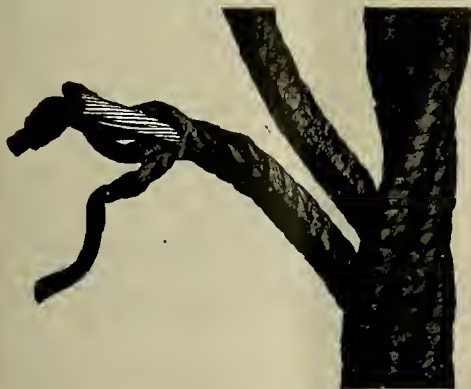
**SHIPPING FACILITIES.**—There are few propositions located more advantageously for shipping than those on Gribble island. The mountain side from points where permanent workings would be located at both the Canadian-American Co.'s property, and also the Gribble Island Co.'s property to a deep-water harbor has a precipitous incline, raising about 800 feet in a distance of 2600 feet to the former company's property, while the proposition owned by the last mentioned company is at a lower elevation, and not as far distant from the shore line. At the present time connection between the landing at the beach and the property owned by the Canadian-American Co. is made by a well-constructed skid road  $\frac{1}{2}$  of a mile in length.

**TIMBER AND WATER SUPPLY.**—With regard to the supply of timber on Gribble island it is noticeable that the trees have a scrubby growth as compared with those further down the coast, but the supply is ample for mining and fuel purposes. Cedar, hemlock, spruce and some fir are the varieties on this as well as on adjacent islands.

A valuable water power can be developed from a stream which flows from a lake situated at 500 feet higher elevation than the outcroppings on the Canadian-American Co.'s property. Therefore any machinery required for mining plant can be run by water power instead of by steam.

### Jupiter Transmission Rope.

The Durable Wire Rope Co., 26-30 Atlantic Ave., Boston, Mass., sends a specimen of rope used for



transmission of power, which is composed of wire strands, each strand compactly served with tarred hemp marline, as illustrated, laid up around a spe-

cially prepared heart or center. The marline does not add to the strength of the rope, but is provided for the purpose of protecting the wire strands from wear by contact with outside objects, or with each other. After having worked over sheaves for some time, if treated with a mixture of raw linseed oil and graphite, the marline becomes packed, filling the interstices between the strands, and representing a smooth, cylindrical substance resembling hard rubber, thus protected from rust or moisture.

### Recent Improvements on the Rand.

Gold recovery in the Witwatersrand district, South Africa, is every day being more and more reduced to what practically means a manufacturing instead of a mining basis, says the London Mining Journal. In order, however, for such a policy to be carried out successfully, it is necessary that extremely careful records be kept of all the operations incidental to the process, and of these operations none is more important than the exact knowledge of the average grade of ore and the exact tonnage passed through the mill. This work is well exemplified in the new mill of the Village Deep Gold Mining Co., which has been started up. Here complete arrangements have been made for sampling and weighing all ore going through the mill. The ore enters the mill from the crusher house by means of a conveyor belt, which belt passes first over a weighing machine, which automatically records the total weight of ore entering the mill. The ore stream then passes over an automatic sampling machine, which deflects a definite proportion of the ore at regular intervals into a separate bin, which feeds but five stamps of the battery. This one mortar is, moreover, provided with an automatic pulp sampling machine, so that a fair average screen sample may be obtained, and this screen sample would represent the average grade of ore entering the mill in any given period.

The weighing machine is an ingenious piece of apparatus, and is now used at a number of mines on the Rand. The principle upon which the machine is constructed is that of weighing a given length of the conveyor at intervals of time corresponding to the travel of such length, and automatically recording the weight. Thus, if the machine is made to weigh 6 feet of conveyor, it will weigh and record every time 6 feet has passed, and so every portion of the conveyor will be weighed successively.

The chief features of the machine are:

1. A steelyard balanced to suit the unloaded conveyor, and arranged to rise accurately in proportion to the load.
2. A gripping device to hold the steelyard fast at suitable intervals.
3. A measuring gauge or quadrant to ascertain the weight indicated by the steelyard when so held.
4. A recording mechanism to exhibit the result.

The resistance of the steelyard to the load is provided by a hollow plunger suspended in a bath of mercury in such a way that it forms a dash pot or drag against undue oscillation.

The gripping and measuring actions are produced by two cams upon a shaft operated directly by toothed gears from the conveyor drum.

In the machine already made the cycle recurs every five seconds, and is as follows: The steelyard is free for about three seconds, during which time it assumes a position proportional to the load upon that portion of the conveyor which is supported by the weighing machine. It is then gripped by the action of the first cam; the second cam then immediately allows the measuring quadrant to move forward until it touches the steelyard, where it remains until pushed back by the same cam. The first cam then releases the steelyard. The weight is recorded by the backward stroke of the measuring gauge. There are thus four motions—gripping, measuring, recording, and releasing—which occupy somewhat less than half the time of the whole cycle.

It will be readily understood that when the steelyard is in its lowest or zero position it must touch the measuring gauge at its stationary position, as there can be no motion of the latter if the steelyard indicates no load. It has, however, proved impracticable to allow the steelyard to touch the gauge at the zero position, for two reasons: First, it is difficult to adjust the steelyard so finely that it touches the gauge and yet bears no weight upon it; second, the vibration of the conveyor gearing, etc., sets up oscillations in the steelyard, which would allow the gauge to gather a few pounds occasionally, and so introduce an error.

The difficulty has been overcome by balancing the steelyard at a position somewhat above zero, and then subtracting or discounting a corresponding amount of weight each time a weighing takes place. Thus, for instance, if the steelyard is balanced so as to remain in a position corresponding to  $\frac{1}{2}$  cwt. when there is no load in the conveyor, the measuring gauge will register on its return stroke  $\frac{1}{2}$  cwt. each time. If, now, a device is introduced to deduct  $\frac{1}{2}$  cwt. from the register each time, the motions cancel each other and the register remains unaltered.

The device referred to consists of a train of wheels, two of which gear with a pinion carried upon an arm of the wheel driving the register or counter.

It will be seen at once that if the two bevel wheels

move an equal amount, but in opposite directions, the result will be that the pinion is merely revolved upon its axis. But if one of the wheels moves more than the other, the pinion will be driven forward or backward accordingly, and will carry the registering wheel with it. To the spindle of one of these bevel wheels is attached a ratchet wheel having a suitable number of teeth (where the lever is balanced at  $\frac{1}{2}$  cwt. the number would be forty). A lever and pawl, operated from the cam shaft, drives the ratchet wheel one tooth for each cycle, deducting a corresponding amount from the register. The other bevel wheel is driven from the measuring gauge. The register or counter thus operated shows an indisputable record of the quantity passed over the conveyor during any given period—minutes, hours or days.

The measuring gauge, or quadrant, consists of a vulcanite plate securely fastened to a light steel frame. The frame encloses a finely divided steel ratchet wheel, and carries a set of ten pawls of different lengths, engaging the said wheel. This confines the error due to lost motion between the pawls and the wheel to one-tenth of a tooth. There is also a set of ten retaining pawls attached to a fixed stud on the body of the machine. The large steel ratchet wheel is keyed upon a spindle connected with the registering counter, and the frame carrying the pawls swings freely upon the boss of the wheel. This frame has a reciprocating motion imparted to it by means of the cam previously referred to.

These machines have been installed at the Village Deep, Van Ryn, New Goch, Roodepoort United and New Kleinfontein mines.

**SLIMES HANDLING.**—Perhaps one of the most notable tendencies in the newer slimes plants which are being erected on the Rand is the attention which is being paid towards reducing all power losses to a minimum. The first plant where this was fully carried out was that of the Robinson Gold Mining Co., where 10 inch centrifugal pumps, direct connected to motors, were substituted for the smaller sizes previously used, and, in connection with the use of these pumps, pipe lines were installed of sufficient size to bring pipe friction within reasonable limits, and the pumps themselves are run at their most economical speeds. The result of this change was that the 10-inch pumps required no more power to operate than the smaller pumps previously employed, although they did the work of running transfers in fifty-five minutes in place of six to seven hours required by the smaller pumps, so that the horse power hours required were considerably less for the larger pumps than the smaller ones. These pumps are provided with special manganese steel liners, manganese runners, and water service on the glands to prevent the slimes from entering the bearings, and they have shown records of eighteen months' continuous operation with absolutely no repairs whatever. Similar plants have been supplied to the Robinson, Village Deep, Witwatersrand and Simmer & Jack mines.

### A Useful Canal.

Two of the uses of the Chicago sanitary and ship canal, connecting the Chicago river at Chicago to Lockport, Ill., 23 miles away, are indicated by its name: It conveys the sewage of Chicago from the lakes down the Mississippi to the gulf of Mexico; it is almost as deep as the Suez canal, and, when supplemented by other waterways, will become an important commercial and military artery of travel.

At Lockport, the western end of the canal, it is to be put to its third great use—that of power. The water is to turn four water wheels driving electric generators; the electricity generated will be transmitted back to Chicago to light all the arc lamps of the city streets and parks.

Below Lockport much work had to be done so that the Desplaines river might accommodate the 600,000 cubic feet of water per minute that was to flow down it. For the whole project, including the part below the canal, 42,229,035 cubic yards of solid rock and earth were removed. Besides this there were 457,777 cubic yards of retaining wall and bridge masonry.

January 2, 1900, the great engineering work was completed and the waters of Lake Michigan allowed to fill the canal. This took thirteen days. January 17th the dam at the western end of the canal was lowered and the westward flow of water began. Thus the primary object of the canal, sanitation, is accomplished.

The canal is soon to realize its further utility as a source of power. Four water wheels will be used to drive four 4000 kilowatt, three-phase, sixty-cycle, alternating current generators, built by the Crocker-Wheeler Co., Ampere, N. J. The water wheels are of the Wellman-Seaver-Morgan horizontal type. A contract has been signed for the construction of these great dynamos, which will deliver current at 6600 volts. The Great Lakes are thus being utilized for power at both ends—at Niagara Falls and through this canal at Lockport.

The ultimate use of the canal as a section of a deep waterway connecting Lake Michigan and the Mississippi has been in mind ever since the inception of the project. The city of Chicago will have spent \$55,000,000 on this canal. If the canal had been built for sanitation alone, the cost would have been \$18,000,000 less.



### Shaft Bell Signals.

One of the most important matters about a mine operated through a shaft is the signaling arrangements. Electric signals have in late years been introduced into mines; but they do not appear to be in as great favor as the old-fashioned bell line, particularly in wet mines. Some mines have both systems, not having removed the rope-and-gong system when the electric device was installed, which is, generally speaking, a wise precaution on general principles.

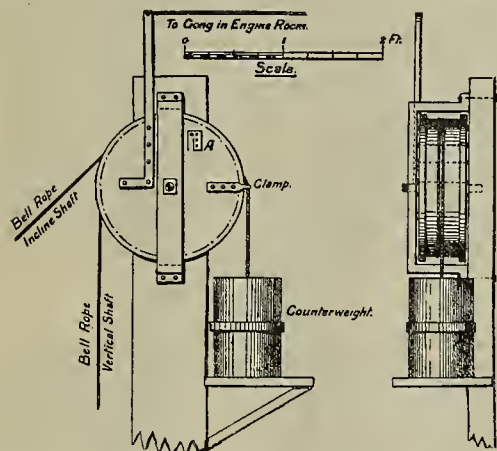
The following is from a paper contributed by E. H. Garthwaite to the transactions of the Institution of Mining and Metallurgy of London:

The subject of mine signals, especially for use in shaft work, is of particular interest to the mine manager. Electric and compressed air installations have proved satisfactory for the purpose of signaling, and, where properly equipped and fitted, seem to leave little to be desired. In many mines, however, mechanical devices are still used, and in the majority of cases they do not prove remarkably efficient, as they are generally clumsy and require a considerable amount of brute strength to work them.

The writer would like to bring before the notice of the Institution a mechanical device which he came across many years ago in Mexico, and which he has since used with great satisfaction, especially in shafts 500 to 1000 feet deep; the device is equally well suited for vertical or incline shafts.

The accompanying diagram shows the arrangement of this device, and it will be seen that the bell rope from the shaft, whether vertical or inclined, winds around a drum made of wood with the sides bolted on; galvanized iron wire rope,  $\frac{1}{4}$  inch diameter, is generally used. An L-shaped lever is bolted to one side of the drum, to one end of which is attached a rope communicating with the engine room.

A special feature of the apparatus is the counterweight, which consists of an iron cylinder, generally a small oil drum, which can be filled with lead, scraps of iron, etc., so that it must counterbalance the weight of the bell rope. This makes it possible to pull the bell rope with a slight exertion, so that if



one is riding in a cage or bucket at a medium speed it is possible to give a signal to stop, if necessary. The counterweight rests on a bracket, and usually a guard is placed around it so as to prevent the possibility of its tipping over.

Gongs are distinctly preferable for the conveyance of shaft signals; but, unless it is possible to treat them gently, they generally get out of order very easily. With this device, however, a gong can be satisfactorily used, for overstraining is prevented by the lug A on the signal drum, which does not allow the drum to turn more than the distance between the lug and the upright iron frame. This distance is regulated by the length of pull necessary to ring the gong properly.

### Searchlight District, Nevada.

Searchlight, in the western part of Lincoln county, in southern Nevada, is taking a prominent place among the rich districts in that State. The Quartette, owned by Boston capitalists, and the oldest property in the district, has a 20-stamp mill at the Colorado river, connected with the mine by a railroad, and also twenty stamps at the mine. This property is now on a dividend-paying basis. Next to the Quartette lies the Good Hope, which is proving to be a duplicate of the former, while the Duplex Co. has a 10-stamp mill operating, and has opened up large ore bodies. The Cyrus Todd has made several shipments of high-grade ore and is preparing to erect a mill. The Santa Fe has been operating under a bond, having milling ore from the grass roots and at 120 feet struck water. The Southern Nevada, owned by New York capitalists, is operating a 10-stamp mill. The Blossom has some of the richest ore in the district. The Searchlight M. & M. Co.'s property, adjoining the Blossom mine, has three distinct separate ledges crossing it; on one a

shaft has been sunk 300 feet, demonstrating an 18-foot ledge, assaying over \$18 per ton. Drifts over 240 feet show the same ledge, carrying same values. The Pompeii, the most northerly located property in the district, has just developed a large ore body at 200-foot level.

### Calumet and Arizona.

The Calumet & Arizona Mining Company's property is at Bisbee, Ariz. Up to about 1900 the Copper Queen was the only large producing company in the Bisbee region, but the Calumet & Arizona Company, organized in 1901, came rapidly to the front and has since become one of the largest producers in the Territory. For more than twenty years the impression appeared to prevail that the Copper Queen Company owned and operated all the ground worth having in that locality, but the extensive development of the



Smelter of the Calumet and Arizona Mining Co., Douglas, Arizona.

Irish Mag and adjoining properties of the Calumet & Arizona Company has proven that mineralization is not confined to the ground owned by the former company. The reduction works of both the Copper Queen Company and the Calumet & Arizona are at Douglas, 26 miles from Bisbee, in Sulphur Spring Valley. The town of Bisbee is scattered along the irregular gulches and on the hillsides in the vicinity of the mines. Although the Copper Queen originally built and operated their smelters in the vicinity, the demands of the mine outgrew the facilities afforded by the Bisbee plant, which led to the construction of a new smelter at Douglas. The plant of the Calumet & Arizona Company is herewith illustrated. It stands on a good site comprising 600 acres. The ore is delivered at the works by the El Paso & Southwestern Railroad. The first furnace was blown in in November, 1902, the second one the following spring, and a third stack in October, 1903, and the fourth one later. The capacity is stated to be 1000 tons of raw ore daily, the output being about 130,000 pounds of refined copper daily. The copper matte from the stacks is taken by electric haulage to the converters where it is blown up to 99% blister copper, containing a small amount of gold and silver. No concentrator is connected with the Calumet & Arizona mine, as all the ore is suitable for smelting. The blister copper is shipped to New York, where it is refined by electrolytic process.

The Calumet & Arizona mines have recently absorbed a number of other properties in the vicinity, and it now constitutes one of the largest copper-producing concerns in Arizona.

### Dredging at Oroville, Cal.

TO THE EDITOR:—In your issue of March 4 R. H. Postlethwaite, in commenting on that part of the annual report of the Oroville Gold Dredging & Exploration Co. relating to the per cent of the prospect value recovered by our dredger, has asked for further information as to what equivalent diameter was used in calculating the results of our original prospect.

We used a diameter of  $6\frac{1}{4}$  inches. This is a mean diameter between 6 inches and  $7\frac{1}{2}$  inches, or the inside diameter of the pipe and the outside diameter of the drive shoe. A drive shoe after being used a short time wears down to a cutting diameter of  $6\frac{1}{4}$  inches, all the material within the cutting edge being forced into the pipe. Of course, to be absolutely accurate, one should base his calculations on the mean diameter taken from the measurement of the drive shoe before and after each drill hole, but this is an accuracy which is not justified by this method of prospecting.

As an independent method of determining our prospect values, and also as a check on the above method, we measured all the material taken from the prospect holes. These two methods of determin-

ing the prospect value were applied to 150 prospect holes, with the result that they checked very closely with one another.

It is interesting to note that the value of a prospect hole as figured on a basis of  $6\frac{1}{4}$  inches diameter corresponds closely with the value as computed by the empirical formula given by Mr. Postlethwaite.

The per cent of the prospect value recovered with a dredger depends upon how closely the ground is prospected. The more holes that are drilled the more nearly the prospect value will come to the actual value of the ground, and the more nearly the per cent of the extraction will approximate the real efficiency of the dredger. I know of an instance where a test was made by drilling 22 holes in an acre. A dredger of the same type as ours on working out this acre obtained 95% of the prospect value.

The extraction of 74% of the prospect value by no means represents the efficiency of the dredger. Tests made of the tailings from the stern of the dredger show that the saving is much better than 74%.

However, it is interesting to note that a dredger operating for two years dredged 22.62 acres which showed a prospect of 1 hole per acre and extracted 74% of the prospect value of the ground.

C. H. MUNRO.

### THE PROSPECTOR.

The mineral sample from Bearmouth, Mont., is coal, variety, lignite. The woody fiber is still visible in portions of it. There is an admixture of clayey matter and iron sulphide also present.

The steel gray soft mineral, with black streak, from Del Norte, Colo., is pyrolusite, a portion of which occurs as crystals in botryoidal masses. This mineral frequently occurs as a pseudomorph after other minerals. The crystals in this case are cubic.

The rock samples from Kichner, B. C., are: No. 1 is greenstone (diabase). No. 2 is evidently a silicified dike rock of some kind; it contains a little copper glance and copper carbonate. No. 3 is a much altered dike rock, now consisting of silica coated with iron oxide. No. 4 is a siliceous felsite; it contains veinlets of iron sulphide. No. 5 is a greatly altered dike rock, possibly one similar to No. 1. On one side appears several incrusting minerals, viz., velvety black and brown iron oxide, crystallized calcium carbonate, and the brilliant sub-metallic soft crystals are iron stained margarodite (hydrous mica). Mine water carrying copper in solution acts in the manner described as occurring at the mine from which these rocks came. It would be a good idea to lead the drainage water through a series of tight boxes (sluices) in which has been placed a quantity of old wrought iron scraps, tin scraps, old tin cans, etc. The copper in the water will gradually replace the iron, and form what is known as cement copper. This can be collected from time to time, carefully dried, placed in tight canvas bags and shipped. It should contain at least 60% copper.

PERMITS to carry on hydraulic mining in California may be secured, if obtainable under existing conditions, from the United States Debris Commission, Flood building, San Francisco, Cal. When a restraining dam that has been built under direction of the Debris Commission is filled by tailings, it is the duty of the miner to either build the dam higher or quit mining. The theory that the commission should look after it is not recognized by the commission, and if the miner continues after his pond is filled and the debris passes over the top of the dam, the commission is likely to revoke his permit. It is much easier to get a permit in the first place than to get one renewed after having been shut down by the commission for breach of good faith.

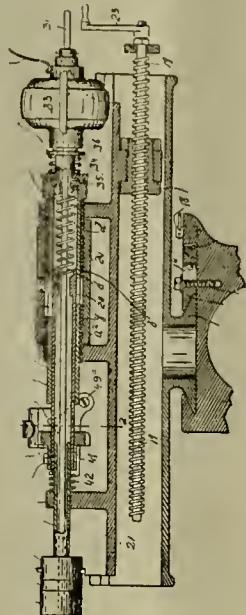


# Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 7, 1905.

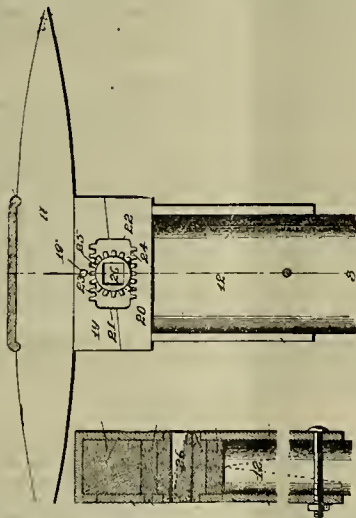
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ROCK DRILL.—No. 783,032; C. G. Foote, Denver, Colo.



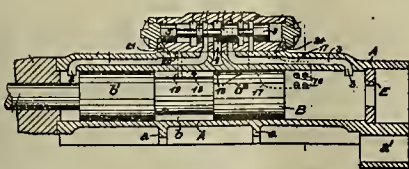
Combination with casing, of cylinder mounted to rotate therein, cylinder being hollow, power spring located in cylinder, latter being provided with cam, hollow drill holder entering hollow of cylinder and having its axis in line with axis of cylinder, drill holder being engaged by cam of cylinder as latter is rotated, whereby drill holder is forced rearwardly against power spring and released, recoil of spring acting to throw drill holder forwardly, causing drill to strike rock with necessary force.

MINER'S PICK.—No. 784,044; M. Hardsocg, Otumwa, Iowa.



Tool, comprising stem formed with recess, pick formed with grooves on one face and mounted in recess, projections on stem seated in grooves of pick, and wedge blocks mounted in stem, one of blocks contacting pick and other stem, wedge blocks formed with oppositely inclined faces in mutual contact and arranged for opposite rectilinear movement for expansion against pick and stem respectively.

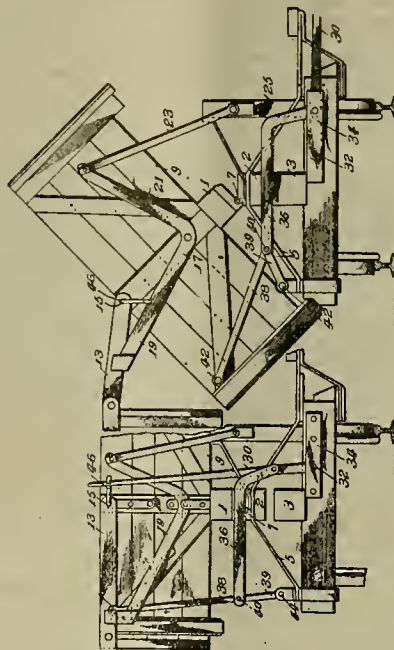
VALVE FOR ROCK DRILLING MACHINES.—No. 784,320; J. E. H. Grose, Germiston, Transvaal, South Africa.



In rock drilling machine, in combination, cylinder A and piston B arranged therein, valve chest F on cylinder formed with ports 9, 10, 11, 12, 13 and 14, valve 4 arranged in valve chest F formed with pistons 5, 6, 7 and 8, cylinder being formed with port

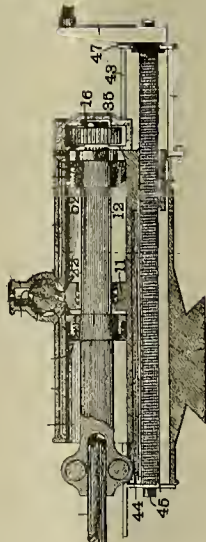
17 and holes 16 placing port 17 in communication with interior of cylinder, port 17 communicating with port 14 in valve chest, port 22, groove 23, ports 24 and 23 placing interior of cylinder and main supply port 1 in communication with end of valve chest, ports 18 placing center portion of cylinder in communication with exhaust port 15, ports 19, 20, 20' and 21 placing interior of cylinder and main supply port in communication with other end of valve chest, ports 19 and 22 being controlled by piston to alternately close ports to exhaust 15 to effect reversal of valve 4.

DUMPING CAR.—No. 784,105; W. R. Cliffe, Harrisburg, Pa.



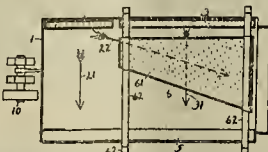
Combination in car of tilting car box having discharge opening, movable door closing opening, arms pivoted to car box and connected with door, bell crank lever connected to car box and coacting with door, whereby movement of car box opens door, hand lever suitably supported, and pivoted connections between hand lever and car box, whereby movement of hand lever tilts car box to dump same and simultaneously opens the door.

ROCK DRILL.—No. 784,173; C. T. McCormick, Fredericktown, Mo.



In drill, combination with cylinder open at both ends and provided with partition, of piston rod passing through partition, piston carried by rod at each side of partition, piston rod being of less diameter than pistons and projecting beyond one of pistons through one of open ends of cylinder, and means for exhausting motive fluid from spaces between pistons and partition and discharging it into open ends of cylinder.

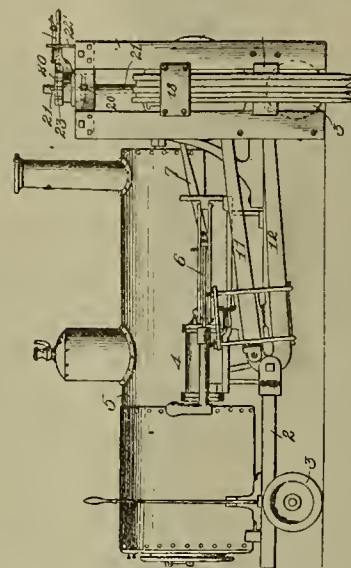
MACHINE FOR CONCENTRATING MINERAL ORES.—No. 784,146; G. R. Duncan, Three Rivers, Canada.



In concentrating table, combination of pulp feed, wash water supply and dropping pan situated upon

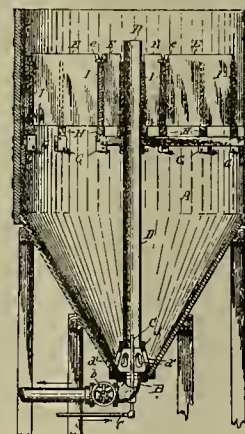
area traversed by concentrates in passing to ore box and across which wash water flows to tailings box and adapted to disturb wash water and settled material beneath.

STONE CHANNELING MACHINE.—No. 784,268; C. M. Lyman, Rutland, Vt.



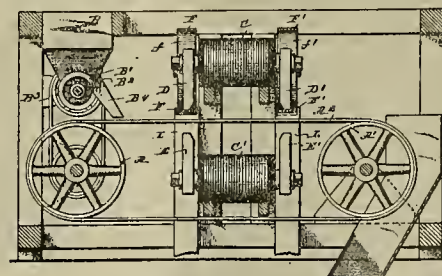
In stone channeling machine, combination of upper slide having means for clamping gang of drills thereto, lower slide, feed screw in threaded engagement with upper slide and swiveled to lower slide, hand operable rotary member through which feed screw passes, screw being provided with longitudinal keyway and member being provided with key to fit keyway, suitably associated upper and lower levers, lower lever being operatively connected with lower slide, and means for vibrating upper lever.

APPARATUS FOR CYANIDE TREATMENT.—No. 784,120; E. L. Oliver, Oakland, Cal.



Apparatus for cyanide treatment of gold and silver bearing materials, comprising tank, open-topped pipe rising within and opening directly into upper portion of tank, lower end of pipe having communication with lower portion of tank, connection from source of compressed air communicating with lower end of pipe; anode and cathode plates within tank; and suitable electrical connections to plates.

MAGNETIC ORE SEPARATOR.—No. 784,502; L. G. Rowand, Camden, N. J.



In magnetic ore separator, combination of conveyor belt adapted to convey material to be treated, of magnets above and below belt, pole pieces of opposite magnets being in proximity to conveyor belt, and discharging belt passing over and beyond and at angle with conveyor belt, discharging belt being interposed between conveyor belt and one of magnets, and belt interposed between conveyor belt and other magnet and extending parallel with discharging belt.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The Leland Dredging Co. is having a large dredger built, to operate on Solomon river, in the Bonanza mining district, Seward peninsula.—An English company has been formed to operate in the upper Kougrok mining district, in the western part of Seward peninsula. They will build a 40-mile ditch and lay 34 miles of steel pipe.—It is thought that the source of the gold of Ophir creek has been discovered in a large ledge of free-milling gold on the head of Crooked creek.

The Fairhaven gold placers of Seward Peninsula are described by F. H. Moffit in bulletin 247 of the United States Geological Survey. This region occupies the northeastern portion of Seward Peninsula and comprises a little more than one-quarter of its total area, or 7500 square miles. It includes the whole of the Fairhaven mining precinct, except that which lies east of Buckland river, the eastern portions of the Goodhope and Kougrok precincts and the northern part of the Koyuk precinct. It is limited on the west by the north-south ridge, extending from Baldy mountain to Devil mountain, and on the east by Buckland river. Its northern boundary is formed by the Arctic ocean and Kotzebue Sound, and it extends southward to the Bendeleben mountains and lower Koyuk river. The northern part of Seward Peninsula is characterized by general low relief and monotonous topography. This particular region is inclosed on three sides by more or less continuous ridges. The drainage is not simple, part of it reaching the Bering sea by various ways and part the Arctic ocean. The placer gold field in that portion of Seward peninsula which lies to the south of the eastern extension of Kotzebue sound is 40 miles long and 20 miles wide, and is surrounded by low moss-covered hills that are natural breeding places for mosquitoes and black flies. The gravels of this field have yielded \$415,000 in the three years beginning with the discovery of gold in 1901 and ending with the season of 1903. The chief producing streams, in the order of their output during those years, are Candle creek and Immachuk river. The Candle creek gravels are the richest that have yet been discovered in this field. They have been the most vigorously exploited, with the result that about three-fourths of the total output of the region has come from this one stream. In the Immachuk region gold has been found in greatest amount on the Immachuk itself, but it has also been obtained from several of the tributaries, especially Old Glory and Hannum creeks. Cunningham creek, Nelson gulch, American creek and Pinnell river have produced still smaller quantities. In addition to these localities Bear creek, a tributary of Buckland river, and Alder beach, nearly 10 miles west of Kiwahik, have a small gold output amounting to \$20,000, equally divided between the two. The gold-bearing gravels, with the exception of those on Bear creek, are of local origin and are derived from the decomposition of schists, through which the gold is disseminated in fine stringers and veins of quartz. The concentration of the heavy metal has been brought about by the action of water currents, which have separated it from a vast amount of rock material and deposited it where it is now found. Coal of inferior quality has been reported from a number of localities in this region.

The Alaska-Detroit Co. are operating at Windfall under the management of Thomas Ellis, who is putting in a hydraulic elevator.—Engineer Geo. Otterson of the Mansfield Co. has taken men to McGinnis creek, near Juneau. A small hand drill, with power from a compressor, will be used to huddle the boulders this season, and a heavy head of water will be used.

### ARIZONA.

#### Graham County.

The Cuprite Copper Co., of Columbus, Ohio, is said to have started work at its mines near Metcalf under the direction of F. C. Alsdorf.

#### Mohave County.

The mill of the Blue Ridge M. Co., east of Vivian, has been started.—The contractors on the St. Louis mine at Cerbat have begun work. T. R. Garnier is superintendent.—L. D. Godshall, J. Geller, A. C. Godshall of Lansdale, Pa., W. G. Bonnevill, C. Ziegenfuss, H. K. Hartzell, M. T. Ochs of Allentown, Pa., and R. E. Wilson of Chicago have been at Cerbat in the interest of the Arizona-Mexican M. & S. Co., regarding the possibilities of building a smelter.

#### Yavapai County.

The Bunker Hill M. Co., 14 miles from Prescott, have reached ore after driving their tunnel 1250 feet. It will be driven 200 feet farther, when Superintendent Julius Moro expects to put up a reduction plant.—It is reported that a 60-ton roller process quartz mill is to be placed on the Rincon mine, south of Congress.

The Octave mine and mill at Octave have been closed.—The Anderson Metals Extraction Co. has commenced work on the foundations for eleven cement tanks at McCahe, for its cyanide plant to work the tailings produced by the Model G. M. Co. mill. These tanks will be 43 feet in diameter each and 4 feet high.

### CALIFORNIA.

#### Amador County.

W. C. Dixon of Colorado has bonded from F. M. Potter of Plymouth mining property north of Plymouth belonging to Potter. The agreement requires Dixon to put up a 10-stamp mill and sink a shaft at least 500 feet deep on the claim.

The tailings from the Voorheis chlorination works at Sutter Creek are again being tested by Harrah Bros. of Oakland.—It is reported that twenty stamps of the Zeila mill at Jackson have been started.

#### Butte County.

Cement brick factories are to be built at Chico and at Auburn, Placer county.

#### Calaveras County.

(Special Correspondence).—At the Union copper mine at Copperopolis the foundations for the steel head frame are complete, but the steel for its construction has not yet arrived at the mine. Superintendent G. McM. Ross states that construction of the new smelter plant is also progressing satisfactorily, though it will be some time before the work is completed. Development of the mine is progressing, and by the time the reduction works are ready the mine will be in condition to supply a large tonnage regularly.

Copperopolis, March 13.

The shaft of the Sultana mine at Angels Camp is being repaired and the machinery put in condition to resume work.—The Utica M. Co. will discontinue the chlorine plants east of Angels and ship all the sulphurets of the company's mines to the Selby Smelting Works for treatment, claiming that the sulphurets can be worked cheaper there than they can be handled in the company's own works. An aerial tramway is being built from the Stickle mill to the Sierra Railway depot.

#### El Dorado County.

Superintendent Spech of Oroville is unwatering and opening up the Church mine, near El Dorado.—At the Clipper quartz mine, above Placerville, H. G. Kopikus is sinking prospecting shafts.—It is reported that the Jasper mine, near Jurgens, is to be started.—At the Pyramid mine, near Rescue, Superintendent John Bluett has thirty men and three machine drills at work.

The Union gravel mine, on Port Hill, is running.—It is reported that the Santa Claus mine, in Greenwood district, has closed down.—Work has been resumed at the Alpine mine, near Georgetown.—W. S. Hickman, A. M. Presby, G. Wentworth and A. Orelli have started work on the Hanson mine, north of Georgetown. A 2-stamp mill has been brought down from the Little Gem mine, at Josephine.—Superintendent Shurtliff of the Monte M. & P. Co., near Jurgens, says that the company will start to build the new flume and ditch for the electric power plant at the Monte mine as soon as the surveyors are through.—J. W. Jurgens & Sons are sinking a new shaft at the Mammoth mine. They are down 35 feet and have a 34-foot vein.

#### Fresno County.

(Special Correspondence).—The court has ordered the receiver of the Copper King mine at Letcher to start operations, its decision being based upon the report of W. J. Adams.

Letcher, March 15.

#### Nevada County.

It is said that J. Martin, J. E. Doolittle, J. H. Hammond, E. A. Forbes and others have bonded all the copper mines near Spenceville along the 20 miles of the route surveyed for the electric road connecting Marysville and Grass Valley.—The Lindsay quartz mine, near Maybert, has been bonded to H. Kahler, superintendent of the Grey Eagle, who will open up the Lindsay this spring.—The new gravel washing plant at the Banner gravel mine, near Nevada City, has been started.

Work has been commenced at the Curnow mine, at Badger Hill, near Nevada City, which was recently bonded by P. Deidesheimer. Three shifts are sinking a perpendicular shaft.—The Murchie mill is being put in shape and will soon be ready to commence crushing ore.

The report of the North Star mine shows that in 1904 the North Star mine produced \$781,273.34, at a current operating cost of \$317,933.53 and an operating profit of \$463,339.81. During the same period \$273,615.02 was spent—notably, development \$129,502.38, improvement \$123,384.14, property purchase, \$15,885, and sundries \$4,843.50—reducing the cash profit to \$189,688.79, from which sum there have been paid two dividends, amounting to \$141,691.50 and leaving a remainder of \$47,997.29 to be added to the cash surplus, which, with interest, etc., increases that sum at the end of 1904 to \$273,055.39. The current expenses amounted to 40.7% (40.7 cents being the cost of a dollar produced), leaving 59.3% as operating profit. The above stated outlays for capital accounts and sundries amounted to 35.02% of the total product, leaving 24.28% as net cash surplus, available for dividends. The total output for the North Star mine (not including Gold Hill) during 1904 was 47,447 tons of ore, yielding \$773,215.81 (\$16.296 per ton), costing for all operating expenses \$313,151.26 (\$6.60 per ton) and leaving an average profit of \$9.696 per ton. The development accounts of \$129,502.38 include \$29,126.10 spent in prospecting in the Gold Hill mine, now suspended without definite, or, so far, very encouraging results. The larger part of the sum charged to development has been spent in the North Star mine and wholly in the Central shaft workings, in building the main incline, extending the openings of the mine and developing ore. The company spent \$64,559.26 on the new mill and cyanide plant at the Central shaft. The total cost of the mill and cyanide plant at the end of the year amounted to \$91,005.74. The mill commenced operation in August and has since been working efficiently. During the latter part of the year the old mill was thoroughly overhauled and renovated. Both 40-stamp mills are working at full capacity, crushing 7000 tons per month. The disbursement account shows that the operating expenses of the North Star were \$114,649.20, Central shaft \$110,021.45, North Star mill \$17,244.17, Central mill \$8749.91, Gold Hill mill \$2877.33, sulphurets \$14,331.53, cyanide plant \$6567.26, bullion \$1728.18, miscellaneous \$17,760.70; total \$294,409.73. Development expenses were: Central shaft \$100,876.28, Gold Hill \$29,126.10; total \$129,502.38. Improvement expenses were: North Star \$16,024.81, mill \$16,391.81, Central shaft \$15,430.24, Central mill \$50,060.69, North Star cyanide plant \$8644.22, Central cyanide plant \$14,498.57, residence \$2333.80; total \$123,384.14. Property purchase expenses were: Irish American \$16,330, Kitto deed \$100, Gold Hill \$455; total \$16,885.

#### Placer County.

At the Hidden Treasure mine, at Bullion, Superintendent H. T. Power has been sinking an air shaft to connect with the main tunnel, but has encountered a large amount of water, which makes sinking difficult. Consequently, a boring machine has been bought to bore

a hole to the main tunnel, whereby the water can be drained off.—The Azelia M. Co., at Blue Canyon, is running a 400-foot tunnel and will upraise to strike the main channel.—Gravel has been struck at the Strawberry mine, at Monona Flat, near Iowa Hill. J. Watts, Sr., is the principal owner.

#### Shasta County.

The United States has obtained an injunction from the United States Circuit Court against the Mountain Copper Co.'s operation of the smelting plant at Keswick. The Government's claims were that the operation of the smelting works at Keswick did irreparable injury to the vegetation on various lands owned by it in the neighborhood. The Mountain Copper Co. contended that the damage done was slight and that the granting of the injunction asked for would ruin its business. Incidentally to the pleading of the case it was brought out that the fumes complained of by the Government would, if condensed, make 700 tons of sulphuric acid a day—three times the amount used in San Francisco in the same period. The contention that the fumes should be condensed and vegetation saved was opposed by the defendant company on the ground of impracticability. It was asserted that if the acid were made at a great expense the only way of disposing of it would be by dumping it out at sea, at still greater expense. The Mountain Copper Co. has time in which to get a stay of the injunction, and will likely do so by putting up bonds to cover all damage. The company has now started a plant at Port Costa on the bay shore.—After keeping armed guards for two years at a gate it put up at Iron Mountain during the strike in the fall of 1902, and after fighting in the courts in Shasta county for two years to establish its right to maintain the gate at the entrance to its mining ground, the Mountain Copper Co. has voluntarily thrown open the gate and withdrawn the watchmen.

#### Siskiyou County.

Superintendent Addison of the Medina G. M. Co. has started machine drills to drive a 1500-foot tunnel under the old works of the Johnson mine at Oro Fino, being worked by the Medina G. M. Co. The 150-foot crosscut tunnel has opened up the Johnson ledge. The mill is running with ore from the Corson & Krandle mine.—It is reported that J. Hamilton transferred a half interest in his mine at Oro Fino to a party from Spokane, Wash., whereby the parties agree to build a stamp mill within sixty days. The machinery will be run by electricity.—The Gardner & Eastlick hydraulic mine at Oro Fino has plenty of water for the elevators and is running night and day.—A. C. Brokaw & Co. has started a tunnel on the Advance mine on China gulch.—The Morrison & Carlock mine at Quartz valley is to be equipped with a new plant for sinking on the vein 200 feet. The 10-stamp mill is being run continuously.—Moxley & Burton have stopped work on their quartz ledge, near Oro Fino. They expect to resume work shortly on a new tunnel site to tap the ledge by crosscut 150 feet from the apex. A shaft has been sunk 110 feet.—The new mill of Harris Bros. & Bassford on Taylor creek, near Oro Fino, is ready to start.

#### Trinity County.

The United States Geological Survey has set aside \$25,000 for the purpose of making a thorough and systematic investigation and exploration of the platinum deposits in Shasta and Trinity counties, and work will be begun at once. Josephinite, another mineral found in very few places, will be looked for under the appropriation just made.

#### Tuolumne County.

Work has been started at the Mazepa mine, near Stent, by Superintendent T. E. Martin.—The hoisting plant of the Gagnere mine, near Tuttle town, has been taken to Calaveras county.—The Providence Con. M. Co. of Tuolumne have bought the Bully Hill quartz claim from F. W. Cook, the Dividend from H. Anderson and the Southern Cross from J. E. Beckwith.

The Champion mine, 1 mile north of Coulterville, has been bonded to C. E. Van Meter, who has started unwatering.—The new Calico mine near Tuolumne is to put in a new hoist. Sinking will be resumed.—The force on the New Tonopah, near Pine Log, has been increased.

The 10-stamp mill of the Los Angeles mine, on the Tuolumne river, below the Mohican, has been running steadily since Feb. 16.

### COLORADO.

Colorado produced \$2,617,649 more gold in 1904 than it did in 1903, according to the figures of Commissioner E. L. White of the Bureau of Mines. In 1904 the gold production in Colorado was 1,171,892 fine ounces, valued at \$24,223,007. For 1903 it was 1,045,252 fine ounces, valued at \$21,605,358. Silver produced in 1904 amounted to 12,960,777 fine ounces, with a value of \$7,416,156; for 1903, 13,245,483 fine ounces, valued at \$7,679,710. The total value of the precious metals mined in the State during 1904 was \$40,783,074; for 1903, \$33,373,099. Lead produced in 1904, 107,546,850 pounds, valued at \$1,624,514. Copper, 9,401,913 pounds, valued at \$1,205,607. Zinc, 64,976,235 pounds, valued at \$3,313,787.

#### Boulder County.

It is reported that the United States Gold Corporation has made a strike of rich molybdenite gold ore in their properties on Arapahoe peak, 6 miles west of Eldora.

#### Clear Creek County.

W. Clair and J. Barker have struck mineral on the Barker claim on Republican mountain, near Silver Plume.—The shaft of the Barmettler & O'Connell lease on the Frostburg lode is 50 feet deep. The shaft is passing through a large body of ore, and, after sinking 50 feet more, levels will be started to open the ground for stopping.—Stevens & McGrath have twenty-five men on the Mendota property, which they have under lease in connection with the mill.—The Silver Plume Board of Mines and Trade has elected C. S. Desch, president; W. H. Stephens, vice-president; W. J. Guard, secretary; C. I. Burt, assistant secretary; A. B. Clark, treasurer.

The Argentine tunnel of the Waldorf M. Co. of Georgetown is in 3800 feet and has cut 44 veins, from 30



of which shipments can be made. Very little drifting has been done on any of these veins. The Commonwealth vein will be cut a depth of 700 feet below the upper workings. This tunnel will also cut the Johnson, Wheeling, Independence and Whendon lodes at an average depth of 1400 feet below the upper workings, and when complete, making connections with the Stevens, will be 9200 feet long and will cut 95 known veins. A new air compressor has been put in at the mine and the power for running the same is furnished by the United Light & Power Co. Two large water Leynor power drills and three small drills are in constant operation in this tunnel. — The Tohin tunnel is 600 feet higher up the mountain than the Argentine tunnel, and, according to the report of Superintendent Tingle, will, within four months, cut the ninth level of the Stevens mine. The purpose in starting this tunnel was to reach the Independence vein, which has produced large quantities of high-grade ore, and when completed will furnish good air to the entire Waldorf property. — E. Wing & Co. are operating a contract on the Kittle Ousley, near Georgetown, and have a body of ore and quartz 4 feet wide. — The Waldorf Co. will build a 50-ton concentrating mill at the mouth of the Argentine tunnel.

President Seeman of the Yankee Con. Co. at Lombard is calling for bids on the new Lombard shaft house. A 100 H. P. boiler, an air compressor and air drills have already been purchased and will be hauled up to the mines from Yankee. The company will build its own assay office. The milling facilities will be increased.

#### Freemont County.

(Special Correspondence).—G. W. Brown & Co. have started their 50-ton cyanide plant working over the dump at the old National mill. It is estimated that the dump contains 20,000 tons. — The oil industry is on the increase in this section. The oil field at this place which has been developed is 4 by 6 miles, and is in the Arkansas valley. There are two refineries — one is controlled by the United Oil Co. and the other by A. R. Gumaer. The United Co. is the only one buying from outside parties. This company purchases the crude oil at the wells and pipes same to the refinery. It is estimated that at present there are 2500 barrels crude oil produced in the district each day. Several independent companies are preparing to start operations within the next 30 to 60 days. The Blaney Oil, Gas & Refining Co., which has a lease on State land, will start work in a few days. A royalty of 10% is paid to the State. The specific gravity of the oil produced in this field is from 30 to 32. On Feb. 1 the price on crude oil was reduced from 90 to 80 cents per barrel. It is understood that lubricating oils are not manufactured here. The main products are kerosene, benzine, gasoline and distillates. After the various illuminating oils have been taken out of the crude oil the residuum is used mainly for fuel. Occasionally a well commences to produce when only 1600 feet down, but as a rule the wells are 2200 to 2300 feet in depth. — The Union and Dorcas mills are receiving all the ore they can handle from the Cripple Creek district. Florence, March 12.

#### Gilpin County.

The Empress M. Co. has started the Empress mine north of Lake View, in the Central district, under the management of C. H. Karns. A new shaft building, 25x54 feet, is being built, and a 35 H. P. hoist put in. The main shaft is down 400 feet. — The Justice mine in lower Russell district is being operated under a lease and bond by J. F. Stanish. — The Black M. Co. are operating under lease and bond the Iroquois mine, at the junction of Willis and Russell gulches, in the Russell district, under the management of H. Rohrer of Denver. The company has been operating the property for three months and has put up a shaft building and a steam hoisting plant. — C. O. Richards has charge of operations at the Chase mine near Russell.

#### Summit County.

The Abundance M. Co., on Mineral hill, near Breckenridge, will sink the shaft deeper and run a crosscut from the shaft to the side lines. J. G. Goodier is manager and T. S. Davidson superintendent.

#### Teller County.

A compressed air motor is to be used in hauling cars from the Morning Glory lode, recently opened in the northern extremity of the El Paso property, on Beacon and Guyot hills, Cripple Creek. The stopes in the new shoot are being blocked out.

The Little Giant M. & M. Co. is putting up a mill and cyanide plant in Pony gulch, 3 miles west of Cripple Creek. — A lease on the Triumph claim, near the summit of Battle mountain, Cripple Creek, has been leased to S. S. Bernard of the El Paso, D. Bernard and J. S. Osborne. The lessees are preparing to install a hoisting plant and sink deeper.

J. H. Hobbs of Colorado Springs has a lease on the Orpha May Nos. 1 and 2 of the Stratton estate at Cripple Creek and has commenced work. — Briggs and associates, who are operating under lease the south end of the Dante property on Bull hill, Cripple Creek, will prospect their territory through the lower Trail tunnel. The lessees have made arrangements with the United Gold Mines Co. to drive the tunnel 100 feet, which is the distance from the Dante line at the present time. By doing this amount of work the lessees are to have the privilege of hauling their ore and waste through the tunnel free during the life of the lease. — Sinking has been resumed in the Lonaconing shaft of the El Paso Company at Cripple Creek.

On the Gold Bond mine in the Caledonia Hill district, Cripple Creek, R. P. Russell is straightening the Sweet shaft preparatory to continuing it to the 400-foot point. — S. McDonald, superintendent of the Henry Adney, the Strong and the El Paso King, has leased property below the Caledonia, near Cripple Creek, and is putting down a 300-foot shaft.

### IDAHO.

#### Blaine County.

W. Deehle is working mining claims 2 miles north of Garfield gulch, near Muldoon. The claims of the Muldoon M. & M. Co. are being worked by J. Peterson. — The Northwestern Co. is driving a 2000-foot tunnel to open up its mines. Foreman J. Gilson has run it 330

feet. Manager Tustin has laid out the site for the 100-ton concentrating mill to be put in.

#### Boise County.

It has been found that the ores of the Pearl district can be cyanided and a number of companies intending to put in concentration plants have changed their plans. The Idaho G. M. D. Co., M. M. Makoever of Boston, secretary, is now excavating for a 100-ton plant at the Osborne mine. The Black Pearl Co. is also putting up a 150-ton plant.

#### Canyon County.

On Payette river, below the junction with Deadwood fork, a big tunnel has been nearly completed through a basaltic cone, to divert the river, leaving 2 miles of the old channel bare. A 5-foot wooden stave pipe will carry the water 1 mile to give a 62-foot fall for a hydro-electric plant to generate power for Boise and the surrounding country. At first the tunnel was 16 feet wide, 12 feet high in the arch and 9 feet high at either wall. Later the width was made 20 feet, and now the management is enlarging to 20 feet width. L. Bunch is manager. In driving the tunnel through the rocky cone serious flows of hot water were encountered. The 2 miles of the old channel exposed by the tunnel will be placed by means of hydraulic pressure obtained from the Payette. Three-quarters of a mile below the tunnel, along which distance the big pipe is to be erected to give better fall for the power plant, will be washed part of the year, but in flood times will not be available, as the pipe will not handle the entire stream. The new plant is estimated to furnish 10,000 H. P.

#### Elmore County.

E. W. Fisher, general manager of the Daisy and Overlook properties at Neal, near Boise, has started the mill. The Daisy shaft, now down 200 feet, will be sunk another 100 feet. A crosscut tunnel is being driven to cut the Daisy ledge west of the shaft. The tunnel is in 130 feet. Work will soon be started on a small cyanide plant to test the Daisy ores.

#### Idaho County.

The bucket elevator dredger 2 miles below Warren is to be started by Manager Alexander as soon as the ground is thawed. — On Shesler creek, near Warren, Herb. Cook is ready to begin work, as is also Geo. Smith on Euston creek. — At Grouse creek, near Resort, 15 miles west of Warren, the Golden Rule hydraulic placers are ready for work. — F. H. Brown of Colfax, Wash., will work four claims north of Warren. He has put up a 3-stamp mill and will employ a large force. — J. B. Brown of St. Louis, leasing the Springfield group, near Warren, will put in a cyanide plant. — Chas. De Grundy, superintendent of the Keystone mine, 4 miles south of Warren, will sink the main shaft 150 feet.

#### Latah County.

A rich strike is reported to have been made at the White Cross mine, on Moscow mountain, 7 miles northeast of Moscow. S. Tinker of Murray has started the mill.

The Idaho Legislature has appropriated \$40,000 for the school of mines at Moscow. A. S. Miller, instructor in mines, will supervise the construction of a complete mining and metallurgical laboratory.

#### Lemhi County.

O. P. Chisholm of Bozeman, Mont., and W. C. & C. E. Morris of Pony, Mont., are organizing a company for the operation of their claims in Beaverhead county, Mont., and Lemhi county, Idaho, and expect to drive a tunnel from one State to the other in an endeavor to tap the lead.

#### Owyhee County.

A second ledge has been cut in the War Eagle tunnel, near Silver City. It was opened in a crosscut driven from the upraise that is being made to open the old works. The vein is 5 feet wide and the walls are well defined, but at the point where it was cut by the work it shows low values. H. L. Woodburn, the general manager of the company, is at the tunnel making an inspection of the property.

#### Shoshone County.

The Golden Chest, near Murray, being worked by M. and J. H. Hayman of New York, is running a tunnel 2700 feet long, to get out the ore without hoisting. It is reported that the mill will be enlarged from 20 to 50 stamps. — The Bear Top Co. is completing a 150-ton concentrator which may be started within a month. It should start within six weeks. The 1-mile tramway is complete. — The Mascot M. Co., promoted by C. S. Chrysler, has started work with its dredge on Trail creek.

The Gold Hunter M. Co., at Mullan, has resumed work with sixty men. The mill was recently overhauled and partly reconstructed and is giving satisfactory results. The company is figuring on putting in electric power to operate the mill. The new lower tunnel has been temporarily discontinued. — The Morning mine, at Mullan, is working 250 men.

J. A. Ward, of Thiard, Idaho, says that the Wake Up Jim gold mine on Trail gulch will operate this summer. A 10-stamp mill and cyanide plant will be put in. The property is on the divide at the head of Trail gulch between Wallace and Murray.

#### Washington County.

The Iron Springs M. Co. at Iron Springs, 5 miles north of Black Lake, will build a 100-ton cyanide plant this summer. D. C. Nevin reports that a large body of high-grade ore has been opened up. The company owns the Iron Springs, Pactolian, Holbrook and Kearns groups. The property carries a wide fissure zone of siliceous, schistosity formation, impregnated with auriferous pyrites in walls of greenstone and diorite. — It is reported that the Ladd Metals Co. has purchased the entire holdings of the American M. Co. in the Seven Devils. The Ladd smelter at Landore has been temporarily closed down.

### MONTANA.

#### Beaverhead County.

At the Indian Queen property at Farlin the Amalgamated Copper Co. has built new engine and hoiler houses, a new blacksmith shop and other buildings, put in a 80 H. P. engine and hoiler, an air compressor and

two machine drills. The old company had run a tunnel into the hill on the Indian Queen 500 feet and 300 feet from the entrance had sunk a shaft 150 feet. At the bottom of this shaft the new company has run a tunnel 150 feet and are now raising to the level of the tunnel, and when this level has been reached a station will be made in the granite and hoisting machinery put in. Sinking will be continued to a depth of 500 feet, a station being made every 100 feet. There are thirty-five men at work.

#### Fergus County.

The past winter's operations at the Yogo sapphires mines have been the most successful yet known there. An immense amount of vein matter has been taken out, and the number of gems contained is larger than ever before, while the sapphires themselves are of higher grade than usual. The London company, which has worked forty months all winter, will increase the number to seventy-five. — The Sweeney company has been successful. The sapphires occur in a dike of trap rock in white and gray limestone. The dike extends for 5 miles and contains occasionally stones as large as five carats. The stones are obtained by means of sluice boxes fitted with Hungarian rifles, the boxes being given a slight pitch to prevent the stones being carried over the rifles.

H. H. Lang of the Kendall mine, at Kendall, is putting in a 150 H. P. electric hoist, a new compressor and station and sinking pumps.

A. Scibler and A. Russi of Kendall have bonded to W. G. Moore of Colorado Springs, Colo., a group of claims in the North Moccasin district, including the Cape Nome, White Elk, Fourth of July, Elizabeth, Bombshell, Powhattan and Sassacass.

#### Jefferson County.

(Special Correspondence). — The Corbin-Wickes M. Co.'s property near Corbin is to be developed, according to J. A. Bender of Chicago, Ill., who claims that he has interested several Chicago capitalists, including W. H. Cribben, C. W. Andrews and C. Bonner. Sections of the district are being prospected with a diamond drill to determine what the ground contains below the depth of the shafts.

Corbin, March 12.

#### Silver Bow County.

(Special Correspondence). — The Butte Copper M. & S. Co. shipped 508 tons of ore from the Dutton mine in East Butte between Jan. 1 and Feb. 19, for which \$10,162.37 was paid. The shaft is down 350 feet. — The Glegarry mine, owned by the Montana Ore Purchasing Co., is in operation under lease. The mine has been equipped with an electric hoist. No attempt will be made to unwater the lower workings, which are down 1000 feet. — The Cambers mine in the eastern section, and owned by the Amalgamated, is yielding 100 tons of first-class ore a day and a good quantity of second class ore. — The Monitor claim, near the Cambers, is yielding from 15 to 25 tons of good copper-silver ore a day. The shaft is 270 feet deep and the work is being confined to the 200 level.

Butte, March 13.

### OREGON.

#### Baker County.

Owing to the early spring, placer operations have begun in most of the camps of eastern Oregon. The snowfall the past winter has been light, but the supply of water depends on the manner in which the snow melts, and the amount of rainfall during the spring months. The Carpenter diggings in Pocahontas district, 7 miles from Baker City, are in operation with two giants. M. Carpenter has charge. — A. D. Cavin, who is associated with W. J. Patterson and F. W. Eppinger of Baker City in the ownership of 160 acres of placer ground at Cow creek, a tributary of upper Burnt river, has been at the placers directing the construction of a bedrock flume 500 feet in length. This has been finished and the placers are ready for operation. — Below the Cavin placers A. A. Groves has drifted on his placers and will operate a giant this season. — F. W. Talmadge, manager of the Oregon M. & I. Co., has been constructing a 9000-foot bedrock flume at the lower end of Sawmill gulch. — Hazelwood & Brown have had a force at work preparing their ground on Eagle creek for operation this season. — The Powder river claims owned by C. I. Slade, Thompson & Small and Miracle & Wallace, will be worked this year. — It is reported that Seattle, Wash., people are going to open up the Rattlesnake diggings to thoroughly equip the property and bring in a plant. — The Connor creek mine and Flick's bar property on Snake river have been in operation a month with two giants each. — The Rye valley and Mormon basin placers will be operated.

M. N. Thompson of Weatherby, Or., general manager of the Granite Mountain G. M. Co., reports that 800 feet of development work has been done by the company and that plans for a mill are to be considered.

The Cyclone M. Co. has bought the Curtis claims, between the Cyclone and Virtue mines, near Baker City, for \$12,500.

#### Grant County.

It is reported that Manager Gibbs of the Copperopolis mine, near Dixie creek, will start building a reduction plant.

A shaft is to be sunk on the Sheridan mine, near Granite. Manager O. C. Wright of Sumpter intends to put on a hoisting plant.

#### Jackson County.

It is reported that I. Ray and A. Houck of Gold Hill have opened up 4 feet of asbestos on Cedar mountain, 35 miles from Gold Hill, on the headwaters of Evans creek.

#### Josephine County.

A. C. Hooper, manager of the Mt. Pitt M. Co. on Jump-off-Joe, will put in a 5-stamp mill. Water power will be used. — H. D. Sluter is operating his placer mine on upper Wolf creek, near Grants Pass. — The Golden Drift M. Co. has completed the pipe line connecting the pump with the four giants at the diggings. The pipe line is 1500 feet long and the pipe is 22 inches in diameter. The water will be pumped direct to the giants, forks in the pipe dividing the stream near the diggings. Four giants will be used. — The main tunnel of the Queen of Bronze mine at Takilma is in 800 feet.



It is reported that the smelter is to be blown in when the roads are opened up.

The Michigan M. & M. Co., of which W. T. Perry of Portland is manager, will spend \$50,000 in the development and equipment of its quartz mines on Applegate river, 8 miles south of Grants Pass. Men are building a mill, shops, quarters and developing the mine. The mill will be supplied with rifles, separators and vanners. The camp is known as Michigan City.

#### Lane County.

(Special Correspondence).—The assay office and transformer room of the Lucky Boy M. Co., at Blue River, were burned down Feb. 12, thus closing the 40-stamp mill. Arrangements have been made to put in a transformer that will allow twenty stamps to start until the new transformer can be obtained from the East. The mines are in shape to keep the whole mill running double shift. Blue River, March 10.

The 4-stamp mill of the Great Northern mine, in the Blue River district, has been started. Teams are hauling ore from the mine to the mill, as the aerial tramway has not been completed.

### NEVADA.

#### Churchill County.

Work on the new cutoff of the Southern Pacific between Hazen and Fort Churchill, connecting the main line with the Carson & Colorado, giving it direct communication with the gold camps of southern Nevada, has begun and will require three months for completion.

#### Esmeralda County.

(Special Correspondence).—The 5-stamp mill of the Mohawk Alpine Co. at Silver Peak has been started. Considerable difficulty has been caused by saline water, not only with the boilers, but also in amalgamating. This is the only mill operating near Silver Peak. The overflow from Tonopah and Goldfield is expected to cause a boom. Lots are being staked off and high prices are being asked for prospects that were not worth locating a few years ago. The Mohawk Alpine Co.'s plant consists of boiler, pump, five 1250-pound stamps, 10-foot amalgamating tables, a Wilfley and Union concentrator. A cyanide plant will be put in later. It is reported that Blair's Silver Peak property is to be reopened, and in this event the mill will be built at the mine, 8 miles from water, and the power supplied from either Owens river or the coal mines at Coaldale, 26 miles north of Silver Peak. At Silver Peak the Cambrian limestones are cut by pegmatitic granitic rock, which changes to pegmatite and quartz veins. The ore appears to be connected with these intrusions. The reported strike 12 miles south of Silver Peak is in some low sand hills, which are said to go \$1 to \$2 per ton of sand. Silver Peak, March 11.

The Douglass gold mines near Sodaville have been transferred to the Van Duzer-Douglass M. Co., who will begin active operations and erect a mill. C. D. Van Duzer is president.

The Western Reduction Co. is building a sampling works and 20-stamp mill on the southern edge of Goldfield. Ten stamps will be in operation within a month. The company has a well 100 feet deep that has already proven its ability to supply 20,000 gallons of water daily. The officers are M. M. Bates president, F. B. Keever secretary, T. C. Woodworth manager and engineer, F. A. Thompson superintendent.

The Douglas and Bounce groups of the Silver Star, 8 miles west of Sodaville, have been sold for \$50,000 to C. D. Van Duzer and associates by E. Grassi, T. Pepper, G. Futtler, D. Robb and W. Douglas. There is a 5-stamp mill on the property, and more will be added.

#### Humboldt County.

The Vulcan mine, 2½ miles from Winnemucca, is shipping to the United States Smelting Co. at Bingham, Utah, low-grade ore to be used as a flux. C. C. Nichols is in charge.

### NEW MEXICO.

#### Dona Ana County.

At Organ an outside shaft 400 feet deep is being sunk on the Stephenson-Bennett with the hope of reducing the cost of raising the ore. The mill capacity is to be doubled. J. I. McCullough is president of the company. The hanging wall is a hard blue limestone and the foot wall is a granite-porphry dike. The ore bodies are chiefly in the lime. The principal minerals are galena, argenticite, anglesite and wolframite.

#### Santa Fe County.

The Golden Cement Co. is completing a concentrating plant to cost \$10,000 near Golden Camp to work the cement placers. The process is to be a dry concentration after crushing the cement. This is the newest part of the placer district. The gravel averages from 25 cents to \$1 per yard of material handled. Scarcity of water has been the serious obstacle in the development of the district. The fineness of the gold is about 920.

#### Sierra County.

Shandon is the name of the new town in Sierra county on the Rio Grande above the mouth of Apache canyon, which is supported by the placers in the Caballo foothills. These mines have yielded \$1000 per month during the past year, the Mexicans doing most of the mining. The Parker Bros. of El Paso have bought several hundred acres of placers in Tiojillo guch, and are installing hydraulic machinery for ground sluicing. The anchor boats and other appliances are completed and are anchored in the Rio Grande, awaiting the arrival of the machinery. A 6-inch pipe is being laid to the reservoir, 2 miles from the river, and with the triplicate pump now being installed water enough can be thrown into the reservoir in twenty-four hours to furnish an eight-hour run. The plant should be in operation by April 1.—Goss Bros. of Salt Lake City, Utah, have leased and bonded the Silva property of 640 acres and will operate it.

### SOUTH DAKOTA.

#### Custer County.

It is reported that work will be resumed on the Extreme on Ruby creek, 3 miles northwest of Custer City, by Superintendent I. Downing. A 10-stamp mill and

cyanide plant have been put on the property.—It is understood that the Le Roy M. & M. Co. will put in a hoist and air compressing plant on its shaft, near Custer City, preparatory to sinking to the 500-foot level.

#### Lawrence County.

The report of W. L. McLaughlin, manager of the Horseshoe M. Co. at Terry, regarding changes in the milling plant during 1904, states that two large tanks, which were used as solution tanks, were moved from above the crusher building back of the mill building and one is now used as a battery solution tank and the other is a barren solution tank. A building 40x72 feet was built over these tanks and two zinc dust presses put in over the barren solution tank; an acid treatment tank and a lead-lined receiver were put in to treat the product and pumps were put in to give a constant head of solution to the classifier; two tanks, 30x14, were moved up in front of the engine room to receive the slimes flowing from the classifiers and allow the clear solution from these tanks to run back to the batteries and to the sand tank, saving pumping. A triplex power pump was connected with the line shaft to pump the solution from the precipitating tanks up through the zinc dust presses. The two zinc precipitating tanks were moved up just below the settling tanks. Two centrifugal pumps were connected with the line shaft to pump the solution from the bottom of the mill up into the battery tank. The three old sump tanks have been changed so that the slimes are given another wash with barren solution and with wash water at this point before they were allowed to run away. A slime press was put in. A new refinery was built near the assay office and contains a drying furnace, cupelling furnace and blast furnace. During the year \$12,472.35 was paid on mill construction, \$8789.88 on mine construction, \$3996.22 on mill improvements and \$2850.93 on mine improvements. The gross bullion returns for eight months during 1904, beginning May 1 and ending December 31, were \$285,757.41. The bullion expense was \$1262.40, leaving net bullion returns of \$284,495.01. There were mined during the year 65,568.28 tons of ore gross, or 60,757.44 tons net. The total cost of mining and milling during that period was \$189,375.80. The average cost of mining was \$1.75 per ton. During December the average cost of mining was \$1.58; milling, \$1.25. This cost was reduced during January. The ore treated in the mill has averaged \$7.22. During December, 1904, the percentage extraction was 73.3.

The Hidden Treasure mine, on Deadwood gulch, has resumed sinking its shaft from 170 feet to 500 feet.—Hoisting has been resumed at the Puritan mine, 3 miles east of Deadwood, after a short shutdown because of water in the shaft. The mill has been enlarged from ten to twenty stamps and an electric pump put in to supply water to run it.

The Custer Peak M. Co. will build a reduction plant at the mine on Custer peak. Sinking has been resumed from the 190-foot level.

#### Pennington County.

It is reported that the Auburn Co. will resume work on its placer bars in Castle creek, above Mystic. Last season the company put in machinery and cyanide vats to catch the very fine gold. The gravel is raised from the pit by an automatic elevator and dumped into sluice boxes with rifles that catch the greater part of the coarse gold. Thence the material is passed over grizzlies, rejecting the coarse material and allowing the finer portion to go through another set of sluices and rifles, at the end of which a 16-mesh screen passes the fine material to the cyanide vats.—It is reported that the Black Eagle mine, in the Hornblende district, 4 miles southeast of Rochford, is to be started.—The Gertie tin mine, near Hill City, is being reopened under the direction of E. C. Johnson. A small tin mill has been put up.—The Mariposa G. M. & M. Co. has been formed to work the Mariposa claims, between Castle and Slate creeks, 2½ miles southeast of Mystic. Chas. Beldin, 816 Nicollet avenue, Minneapolis, Minn., is president and John Wise of Mystic is superintendent. An air compressor and drills are to be put in to drive an 800-foot tunnel.—The Black Hills C. Co. intends to resume work near Rochford.

### UTAH.

#### Beaver County.

The annual report of the Horn Silver M. Co. at Frisco for 1904 shows that there were 15,912 tons of ore produced; of this 522 tons is classed as zinc, 1723 tons of first class, 2452 tons of copper, 8652 tons of crude and 2560 tons of milling. The metals produced from the ores sold aggregated 7,432,855 pounds of lead, 110,541 ounces in silver, 593 ounces in gold, 1,588,287 pounds of copper, 391,676 pounds of zinc. The cost of extraction of each ton of crude ore was \$5.066 and the cost of concentration at the mill was \$1.592. The average value of the first-class ore produced per ton was \$12.02; first-class copper ore, \$28.55; first-class lease ore, \$20.24; zinc ore, \$7.05, and concentrates, \$13.21. The financial statement shows receipts from the sale of concentrates, \$5,890.72; sale of copper ores, \$67,520.47; first-class ore, \$99,553.38; lease ore, \$33,769.24; zinc ore tailings, etc., \$5653.97; net proceeds from house rentals at Franklyn, \$252.50; interest on sundry amounts, \$1793.59; surplus from Frisco store, \$5000, which added to the cash on hand January 1, 1904, of \$51,265.02, makes a total of \$270,998.89. In the items of expense \$80,614.90 was paid out for mine and \$4091.55 for mill operation; \$21,420.70 in royalties; \$33,649.95 in general expense; \$60,000. The treasurer's books showed cash on hand, January 1, 1905, of \$51,890.38, while there were call loans outstanding aggregating \$15,000, and supplies on hand to the value of \$3835.97.

#### Utah County.

The Bonanza M. & M. Co. at West Tintic will be equipped with a concentrating plant. Superintendent C. W. Jones has submitted estimates for a mill to be equipped with rolls, jigs and tables, and the same has been approved.

#### Salt Lake County.

P. H. Hanson of Salt Lake City, who has accepted the superintendency of the Butterfield mines at Bingham, reports that the new Queen mill will be started again. The properties include the Queen, the Eagle

Bird and Northern Chief groups, and are owned by the Conglomerate M. Co., of which G. Lavignino of Bingham is president.

The Bingham Central M. Co. has been formed, with a capital of \$2,000,000, all subscribed, by Samuel Newhouse president, D. C. Jackling vice-president and general manager, C. W. Whitley treasurer, W. M. Bradley secretary. They have started work on claims in the West Mountain mining district.—F. J. Taylor has charge of work on the Jeff Davis tunnel.

#### Tooele County.

T. C. Wiswall of the Greene Reduction Co. says that the plant with which the gold contained in the tailings of the old Marion mill at Mercur is being recovered will go into commission again as soon as the weather shall permit.

#### Utah County.

The Capitol Gold & Silver M. Co. of American Fork has elected R. E. Hunter, president; C. J. Logie, vice-president; J. E. Jensen, treasurer; A. K. Thornton, secretary. They will continue operations on the Gold Blossom mine.—It is understood that the Wyoming mine, in American Fork canyon, which was to resume operations on the 15th of March, will not do so until April 1. Manager G. Tyng is in Texas.

The Clipper & Silver King mine, in the American Fork canyon, will resume operations as soon as the weather permits.

### WASHINGTON.

#### Snohomish County.

The Buckeye Copper Co. has been formed by L. J. Lemley, Columbus Grove, Ohio; J. Coup, Cleveland, Ohio; A. O. Jeffries, Baring, Wash.; E. J. Smith, Cleveland, Ohio, and T. McIntyre, Index, Wash., to work the Index-Independent mine at Index. They will put in air drills and other machinery to drive a new tunnel and continue the old one.—J. J. Habecker, owner of the Wayside mine, near Granite Falls, will put in new machinery.

#### Stevens County.

The Roselle M. Co. has found a large deposit of wolframite on its property in the northern part of Stevens county and is building a 20-ton concentrator to treat the ore.

C. Knutson has taken control of the Great Republic, 5 miles west of Northport, on Sheep creek.

### FOREIGN.

#### AUSTRALIA.

The report of the Broken Hill Proprietary Co. of New South Wales states that the crosscut from the winze from 800-foot level down 115 feet developed a fine ore body 40 feet in width, while there has been only one wall. On the 1000-foot level to the south of McBryde shaft have opened up a fine body of ore 55 feet in width, without walls. Tonnage of ore raised the past half year has exceeded output during previous six months by 19,000 tons, collective tonnage from all sources being 324,535 tons; average, 1800 tons per diem, or 12,482 tons weekly, with satisfactory reduction in working costs. There were 313,543 tons of ore treated by the concentrating plant, mill working well, in every way satisfactory, both with regard to working costs and better recovery of all metals. Result of smelting operations at Port Pirie satisfactory as regards working costs and better recovery of metals, producing 1272 tons pig lead, 38,766 ounces fine silver more than during previous half year. Zinc concentration plant treated 28,000 tons; has a capacity of 600 tons per day of twenty-four hours, in consequence of which, and in order to be to a reasonable extent independent of European buyers, question of the erection of the necessary plant for the manufacture of spelter is receiving special consideration. For this purpose the reserve fund has been increased from £125,000 to £150,000. At the present time the manufacture of spelter is in the hands of only a few firms or companies of limited capacity, therefore the board propose to make ourselves entirely independent of this limitation, and obviate difficulty in the direction of the disposal of our products.

The latest returns for the gold output of Australia for 1904 credit New South Wales with £1,146,000, Queensland with £2,630,000, South Australia with £90,000, Tasmania with £275,000, Victoria with £3,253,000, and Western Australia with £8,425,000, a total of £15,819,000.

### BRITISH COLUMBIA.

#### Boundary District.

For the week ending March 11, the shipments of the Boundary mines were: Granby, for Granby smelter, 12,330 tons; Mother Lode, to B. C. copper smelter, 3040 tons; Montreal & Boston's Brooklyn, 1942 tons; Montreal & Boston's Rawhide, 1681 tons; Montreal & Boston's Mountain Rose, 240 tons; Brooklyn dump to Trail smelter, 130 tons; Montreal & Boston to B. C. copper smelters, 210 tons; Orudenero to Granby smelter, 30 tons; Elkhorn to Trail smelter, 20 tons; Skylark to Nelson and Granby smelters, 60 tons. Total for week, 19,683 tons. Smelter treatment was as follows: Granby smelter, 13,744 tons; B. C. copper smelter, 4324 tons; Montreal & Boston smelter, 3728 tons. Total for week, 21,796 tons. Total for year to date, 172,667 tons. The total shipments for January were 68,074 tons and for February 72,761 tons.

Operations have been resumed at the Winnipeg mine, Wellington camp, after a close-down of sixteen months and the sale of the property to satisfy the labor liens against it. W. T. Hunter, C. D. Hunter, J. Hunter, S. Macy and A. B. W. Hodges have bonded it to the Granby Co. J. Rogers is unwatering the property, so that it can be thoroughly examined and sampled. The mine has a 350-foot shaft. It has a small machinery plant, including air compressor, pumps, hoist, etc., with bunkhouse. A spur of the C. P. R. R. was built to the mine in 1899, and 5000 tons of ore were shipped to the several smelters.

Work has been discontinued at the Senator mine, Summit camp, and the bond on the property thrown up by the Granby Co. The owners are C. Tobiasson and R. Hoffman of Grand Forks.—It is reported that the



Montreal & Boston Con. have taken up the Seattle claim, 10 miles up the North Fork of Kettle river, on a lease and bond from R. Clark and Hay & McCallum of Grand Forks.

Cassiar District.

Extensive strikes of copper and coal are reported from Telqua valley, a tributary of the Skeena river.

Rossland District.

The shipments of the Rossland district for the week ending March 11 were: Le Roi, 3275 tons; Centre Star, 1620; War Eagle, 1380; Le Roi No. 2, 370; Spitzee, 150; White Bear, 405; total for the week, 7200 tons, and for the year, 68,156 tons. F. C. D. Haggard, a director of the Le Roi No. 2, and A. Hill, its consulting engineer, have arrived at Rossland from London to look over their properties. It is expected that they will decide the question of taking up the bond on the Eureka-Evening group, which was bonded to the Le Roi No. 2 last fall for \$175,000. Work has been kept up ever since, and it is said that ore of a good grade has been found. A. McLean, a director in the Velvet-Portland of London, and W. Thompson, consulting engineer for the same company, are to fix the time for the resumption of work on the Velvet-Portland, on which work was shut down about two months ago on account of a shortage of water for the concentrating plant.

CANADA.

The mineral production of Canada for 1904, as compiled from the preliminary figures collected by the Mines Section of the Geological Survey by E. D. Ingall, was:

Metallic Product.	Quantity.	Value.
Copper (b), pounds.....	42,970,594	\$ 5,510,119
Gold.....		16,400,000
Iron ore (export), tons.....	168,828	401,738
Pig iron from Canadian ore, tons.....	68,297	991,880
Lead (c), pounds.....	38,000,420	1,657,420
Nickel (d), pounds.....	10,547,883	4,219,153
Silver (e), ounces.....	3,718,668	2,137,859
Zinc (f), pounds.....	477,568	24,356
<b>Total metallic.....</b>		<b>\$31,222,525</b>
<b>Non-metallic.</b>		
Arsenic (exports), tons.....	73	\$ 6,900
Asbestos, tons.....	35,635	1,167,238
Asbestic, tons.....	13,011	13,006
Chromite, tons.....	6,074	67,146
Coal, tons.....	7,509,860	14,599,090
Coke (f), tons.....	543,557	1,884,219
Corundum, tons.....	619	101,050
Feldspar, tons.....	11,083	21,166
Graphite, tons.....	452	11,760
Grindstones, tons.....	4,509	42,782
Gypsum, tons.....	340,761	372,624
Limestone for flux, tons.....	200,646	176,973
Manganese ore (exports), tons.....	123	2,706
Mica, tons.....		152,170
Mineral pigments—		
Barites, tons.....	1,382	3,702
Ochers, tons.....	3,923	24,905
Mineral water.....		80,000
Moulding sand, tons.....	3,423	6,790
Natural gas (g).....		247,370
Petroleum (h), barrels.....	552,575	984,310
Pyrites, tons.....	300,000	4,500
Pyrites, tons.....	33,039	9,797
Salt, tons.....	68,777	318,628
Talc, tons.....	840	1,876
Triphallite, tons.....	320	6,400
<b>Total non-metallic.....</b>		<b>\$20,302,987</b>
<b>STRUCTURAL MATERIALS AND CLAY PRODUCTS.</b>		
Cement, natural rock, barrels.....	56,814	\$ 49,387
Cement, Portland, barrels.....	850,358	1,107,992
Flagstone.....		6,720
Granite.....		100,000
Pottery.....		200,000
Sand and gravels (exports), tons.....	309,809	129,803
Sewer pipe.....		378,894
Slate.....		23,247
Terra cotta, pressed brick, etc.....		400,000
Tiles.....		275,000
Building material, including bricks, building stone, lime, etc.....		5,667,000
<b>Total structural material and clay products.....</b>		<b>\$ 8,428,053</b>
<b>Estimated value of mineral products not returned.....</b>		<b>300,000</b>
<b>Total, 1904, all products.....</b>		<b>\$60,343,165</b>

(a) Quantity or value of product marketed. The ton used is that of 2000 pounds.  
(b) Copper contents of ore, matte, etc., at 12.83% per pound.  
(c) Lead contents of ore, matte, etc., at 4.30% per pound.  
(d) Nickel contents of ore, matte, etc., at 40% per pound.  
(e) Silver contents of ore at 57.23% per ounce.  
(f) Oven coke, all the production of Nova Scotia, British Columbia and the Northwest Territories.  
(g) Gross return from sale of gas.  
(h) Includes crude oil sold to refiners and oil sold for fuel and other purposes.  
(i) Zinc contents of ores at 5.100% per pound.

GUATEMALA.

The U. S. Consul at Guatemala reports that the mineral deposits of this republic cover a wide range and are very rich. During the early Spanish occupancy of this part of Central America fabulous quantities of gold and silver were taken from Guatemala. Many of the mines were worked as late as the first half of the nineteenth century, but since that time the frequent revolutions and disturbances have discouraged mining. With the quiet that has reigned for the past six years, and with the outlook, much more interest is being taken in mining properties than for many years. The mining laws provide that in case no work is being done on a mine for a period of two years it reverts to the Government, and can again be acquired as in the first instance. The mining laws in general are very liberal, resembling those of the United States, and the interests of the miners are well protected. Some of the old, rich mines are being reopened, and Guatemala bids fair to attract more attention along this line than Mexico. It is a matter of history that at one time there were 140 rich mines worked here. From one group the mint of Guatemala coined silver to the amount of \$43,000,000, besides what was shipped directly to Europe. Large bodies of lead ore are found that run from 70% to 80% lead, with some silver. These are matters of record, and the mines are not difficult to locate. Gold is quite extensively mined, and copper is said to be plentiful. The mica beds are very extensive, and abundance of first-class mica is in easy reach. As yet but little coal of value has been discovered. Iron ore of a good quality has been discovered, but as yet no practical use has been made of it. The climate where the mines are situated is, in the main, temperate, and the heat seldom exceeds from 75°

to 80° in the shade. The sanitary conditions are fine and the country is considered a healthful place to live. In some parts labor is scarce, and as a general thing native labor is not worth much in mines. It can be had for from 10 to 20 cents gold per day, but that is about all it is worth as compared with the labor of practical miners. For common labor the natives do better.

MEXICO.

Guajajuato.

A 100-ton custom mill is to be built at Marfil for the treatment of low-grade ores. D. V. A. Williams is to have charge of the construction.

Guerrero.

E. D. Lukis, manager of the San Mateo mine at Taxco, has unwatered the shaft, but the flow of water being too great for the capacity of the company's pumps, two 75 H. P. boilers and a No. 9 Cameron pump are being put in, after which shipping will be started.

Jalisco.

The Central M. Co. of Philadelphia, Pa., will put in a cyanide plant at the San Felipe mine in the Hostotipaquillo district. C. L. Beard is manager.

Lower California.

The Evangelina Copper M. Co., of Los Angeles, Cal., is operating in San Julián canyon, near Port Canav, on the Pacific coast of Lower California, in the Santa Caterina mining district, 230 miles below Ensenada. It is the intention to build a 50-ton smelter. The president and general manager is D. R. Wilder of Los Angeles.

Mexico.

The chief veins of the El Oro district are the Chihuahua, San Acasio, La Descubridora and San Rafael. The Amistad consists of 50 pertenencias, through which is supposed to pass the Descubridora and the Chihuahua veins, with three small veins, or vetillas, in between. Two vertical shafts have been sunk and connected below for ventilation. The Amistad Co. is sinking a three-compartment shaft to a depth of 200 meters, when crosscuts will be driven east and west to cut the Descubridora and Chihuahua veins. A double-drum hoist and two boilers, 80 H. P. each, also Cameron station and sinking pumps, have been put in. A vertical shaft is being sunk on the Chihuahua, south of the Amistad, and also upon the Descubridora. Steam hoists and pumps have been put on the properties, and also on the Maria Teresa and Santa Rita. The El Oro M. & R. Co. has its most important mines on the San Rafael vein. The ore of the San Rafael is free milling and suitable for pan amalgamation, the tailings being afterward cyanided. The company has a 100-stamp mill and cyanide plant. It intends to sink a shaft on the Somera No. 1, adjoining the El Oro properties on the west. The Guggenheim Exploration Co. of New York has a 100-stamp mill and cyanide plant on the Esperanza. The Dos Estrellas vein is worked by Compania Minera Las Dos Estrellas, who have an 80-stamp mill and cyanide plant, and intend to add 40 more stamps. The Pleyades, Union and Victoria y Anexas are also being worked.

Sonora.

(Special Correspondence).—The Cananea Con. C. Co. has commenced work on a large reverberatory furnace. A modern sampler and ore bedding system for bedding ore before smelting are to be installed at once. Several Willey tables and vannors are to be added to the concentrator. The improvements will cost over \$500,000. W. Wilkins and associates have sold the Palmarito silver mines in the Mocorito district to northern capitalists for \$125,000 gold. R. McCune, vice-president of the Sonora-Bonanza M. Co., whose holdings are located in the Bocoachi district, was here recently and reports that they have discovered considerable quantities of wulfenite and are preparing to concentrate it. The company is working thirty men and shipping ore to El Paso. Continued heavy rains have greatly interfered with mining operations the past month.—The C. C. Co. turned out something over 5,000,000 pounds of copper during February. Cananea, March 7.

MONGOLIA.

The Mining Journal says that the gold mines in Mongolia are worked by a Russian company, who have obtained a concession from the Chinese Government for the working of minerals in the Tusbutukhan and Tzetzenkhan districts in Mongolia: an immense area, on which, however, so far only two mines are worked—one along the bed of the river Iro and its tributaries, all discharging their waters into the Orkhon—Selenga—Balkal; the other is on the other side of the Yablonovoi mountain range on the River Tiridja of the Amur system. The Iro mine is 140 miles east of Kiakhta, and the Tiridja mine is 100 miles beyond Urga. At the mines there are fairly good roads with stations, and traffic is carried on on horses belonging to the company. The founder and organizer of the enterprise, M. von Grot, had vast plans for the development of the same. It was his intention that the production and treatment of the gold should be done by machinery. He ordered, at great expense, engines, boilers, and all necessary appliances for river dredging, hydraulic works, and a gold-smelting plant. All the machinery and plant was obtained from America, and American engineers were engaged to put up the plant and instruct the local men in the use of the same. The dredge did not work, and the hydraulic works made no progress owing to the deep layers of peat formations in one mine and for want of water in the other. In consequence of these failures, Von Grot reverted to the old primitive method of gold washing, and the Americans were dismissed and replaced by Russians. But this again resulted in failure owing to the bad selection of the staff, not one of whom had any technical knowledge of mining. The result of this was that the business began to decline before it had time to develop. Discouraged by the fruitlessness of all his efforts, M. von Grot at the end of 1903 resigned his position of general manager, and the company appointed another in his place with two assistants, both qualified mining engineers. A number of trained miners were engaged for subordinate posts, and the business began to look up. New sets of Russian gold-washing appli-

nances were put up, and gold washing began in earnest; but just then the war broke out, and a large part of the best workmen were called up to serve in the Army, and work at the mines again came practically to a standstill. In August and September there were at the mines more engineers and overseers than laborers, and the output of gold, instead of pounds, was merely an ounce a day or less. Generally the operations last year resulted in a loss, the output of gold for the year, instead of the expected 10 poods (5,760 ozs.), did not exceed 6 poods (3,456 ozs.). The labor at the mines consists of Russian peasants and Cossacks from the Russian frontier villages, and also some Chinese; but the company engage the latter reluctantly, as their work is half as productive as the work of Russian laborers. The native Mongols hire themselves out only for light work, the reason for which may be that digging the ground for gold is considered a sin according to the teachings of their lamas. The men are not on contract, but are engaged daily or by piecework. For a ten-hour working day the wages range from seventy copecks to two roubles. The pay is not very tempting for the men, and when some special work began on the Transbaikalian railway large numbers of men left the mines to work on the railway. Only the direst want and absolute lack of employment drives the frontier settlers to the gold mines, as, apart from the small pay, the conditions of living at the mines are far from attractive. The company provide no dwellings for the men, who are compelled to huddle together in butts or caves hurriedly put up by themselves. Food is dear and of inferior quality, and there is consequently frequent epidemics among the men. At the Iro mine there is a small hospital with three beds and a trained hospital attendant, but at the Tiridja mine the sick are left to their fate. After the arrival of the new general manager certain improvements were decided upon, including the better housing of the men, and workmen's barracks began to be erected at the expense of the company.

Personal.

E. L. BECK is with the Kondall M. Co. at Kendall, Mont.  
F. C. PAINE is with the Ruby Hill mines, Concordia, Wash.  
ALEX. WISE is assayer at the Chollar mine, Virginia City, Nev.  
R. S. DENNISON is assayer Homestake M. Co. at Lead, S. D.  
H. W. INGALLS is manager Copper King mine, near Mullan, Idaho.  
O. J. REYNOLDS is assayer East Pacific M. Co. at Winston, Mont.  
D. D. BUTLER is chemist Boulder Reduction Co. at Jamestown, Colo.  
H. P. GALLIGAN has charge dredger at Delta, Shoshone county, Idaho.  
WILLARD F. FRENCH is now with the Continental M. Co., Vulcan, Colorado.  
P. CASS has charge of the Odin mine in Thaynes canyon, near Park City, Utah.  
H. SIMINGTON is superintendent Grand View property, near Cherry Creek, Ariz.  
THOS. V. CONNOR is superintendent Wild Horse cyanide mill at Cripple Creek, Colo.  
B. H. DUNSHEE is assistant superintendent Amalgamated Copper Co. at Butte, Mont.  
H. D. MORSE is with the Boston & Montana Con. Copper & Silver M. Co. at Butte, Mont.  
E. P. KENNEDY is manager Susanville Commercial Co., at Susanville, Grant county, Or.  
WM. DUNNIGAN has left American Fork, Utah, to take charge of a property at Silver City, Utah.  
R. P. WHELOCK is assistant secretary and treasurer Enterprise M., R. & I. Co. at Kingman, Arizona.  
J. H. HAMMOND is examining the dredging interests of the tributaries of the Sacramento in California.  
CHAS. HANSON has been appointed foreman Witmer & Fuller mine, Placerville, El Dorado county, Cal.  
OTTO MEARS of Denver, Colo., has been inspecting the Golden Eagle Co.'s mine and mill at Winnemucca, Nev.  
J. H. FISK, Portland, Oregon, has been appointed consulting engineer Tenderfoot M. Co., Malheur county, Oregon.  
E. H. HARRINGTON has been elected superintendent Bunker Hill mine at Amador City, vice C. R. Downs, resigned.  
F. R. BALDWIN, superintendent Maitland properties, near Deadwood, S. D., has been visiting Chicago and the East.  
CHAS. BERGSTROM and O. OLESON, Butte, Montana, have left for Koperbik, Norway, to investigate mining properties.  
T. E. MARTIN of San Francisco has been appointed superintendent Mazeppa mine at Stent, Tuolumne county, Cal.  
C. E. BUTLER of Denver has been made manager of mines near Octave, Ariz., recently purchased by a Philadelphia company.  
H. W. BANGLE and M. L. GRIFFITHS are with the Sociedad Minera y Fundidora at Maconi, Cadereyta, Queretaro, Mexico.  
GEO. MORGAN, Salt Lake City, Utah, has been



elected president Sbeba G. & S. M. Co. at Unionville, Humboldt county, Nev.

H. D. SCRIBNER succeeds H. V. Croll as district manager the Allis-Chalmers Co., with offices at 623 Kobl Building, San Francisco, Cal.

M. L. REQUA has returned to San Francisco, Cal., from Ely, Nev., where he has been superintending the development of copper properties.

W. J. ADAMS, E. M., who was appointed by the court to examine the Copper King mine in Fresno county, Cal., has filed his report with the court.

E. H. DAVISON has gone from San Francisco, Cal., as manager U. S. & Mex. Syndicate, to operate extensive properties at Santa Lucia, Sinaloa, Mexico.

G. B. SHIPLEY has resigned as draughtsman in the San Francisco Union Iron Works mining department and taken a position with Allis-Chalmers Co., Chicago.

JOHN HARRIS goes to San Antonio, Nye county, Nev., about 20 miles north of Tonopah, to take charge of active work on three gold and copper properties there.

JOS. WATSON, Spokane, Wash., has been elected superintendent and manager Frisco-Standard M. Co.'s mine on Fish creek, 8 miles east of Boundary, Shoshone county, Idaho.

## Commercial Paragraphs.

H. C. BOSWORTH is now a partner in the new firm of Hoffman-Pintber y Bosworth, assay supplies, City of Mexico.

HENSHAW, BULKLEY & CO. of San Francisco, Cal., report the sale of a Kincaid mill to Brown Bros. of Prescott, Ariz.

THE new warehouses of The S. H. Supply Co., Denver, Colo., fronts 200 feet on Lawrence street and 125 feet on Eighteenth street, and are occupied entirely by this company with a stock of machinery and storing of supplies, together with the offices of the company. Besides this building, the company has three warehouses, a tank factory, trackage and several acres of yard room at Thirty-first and U. P. R. R. tracks. The company reports progress from sales in 1898 of \$12,000 to over a million dollars in 1904.

BLAISDELL CO. of Los Angeles, Cal., patentees and manufacturers of sand vat distributors, excavators and tailings stacking machinery for cyanide plants, has a contract with the Black Mountain M. Co., Magdalena, Sonora, Mexico, for a complete installation of their system. The Black Mountain M. Co. is developing the old Cerro Prieto mine and other properties in that vicinity and is erecting a 120-stamp (1250 pounds) mill, with a cyanide plant, having vats 40 feet in diameter by 8 feet deep, to filter. The Blaisdell system is intended to have a capacity of 100 tons of sand per hour.

THE A. S. Cameron Steam Pump Works, foot East Twenty-third St., New York, report their February business encouraging and the volume of orders increasing. Among their recent sales they report pumps of different sizes and types, mostly mine pumps, for the Union Iron Works, San Francisco, Cal.; three of large capacity for use at Battery Park, New York City, supplied to the Barrett Mfg. Co.; several pumps, with removable hushings for pumping tar, for the D. L. & W. R. R., in New Jersey; a large light-service pump for the Western Tube Co.; three general-service pumps of different sizes for McClung & Co., Knoxville, Tenn.; three general-service pumps for the Oil Well Supply Co., Bradford, Pa.; boiler feeders and general service pumps for Griffiths & Nathaniels, Poultny, Vt.; Granville Die & Machine Works, Granville, N. Y.; New Suddy Coal Co., Tennessee; H. Channon & Co., Chicago, Ill.; Hullock Milling Co., Hullock, Md.; Dept. of Water Supply, Alexandria, Ind. Their foreign shipments are quite active. Fourteen light pumps were ordered from London, Eng., for delivery to the west coast of Africa; six pumps direct to Auckland, N. Z., and special sinking and station pumps to Ste. Anonyme des Mines d'Or de Territo, Brazil, and Cia. Mina. de Penolis, Mapimi, Durango, Mexico.

## Books Received.

"Preliminary Report on the Ohio Co-operative Topographic Survey," by C. E. Sherman, gives a resume of geological work done in Ohio during 1902-1903.

The United States Geological Survey Bulletin, No. 244, "Contributions to Devonian Paleontology in 1903," by H. S. Williams and E. M. Kindle, classifies and discusses evidence found in Kentucky, Virginia and West Virginia.

At a small mine the superintendent who is expected to direct all the details of work around the mine will find some valuable information in "How to Mix Paints," by C. Godfrey. It gives clear directions that will save both time and materials on any job of painting about the mine. It is published by the Industrial Pub. Co., 16 Thomas St., New York City, for 50 cents, and will be sent postpaid by the MINING & SCIENTIFIC PRESS upon receipt of price.

"A Handbook of Construction for Superintendents of Construction, Architects, Builders and Building Inspectors," by H. Ricbey, contains valuable information on materials of construction and their utilization. The whole is presented in a logical manner, and, while condensed to the limits of a handbook, yet it presents all the essential details. It is published by John Wiley & Sons, 43 East Nineteenth street, New York City, for \$4,

and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

The bureau of the census of the United States Department of Commerce and Labor has issued its report on "Mines and Quarries, 1902," prepared under the supervision of W. M. Steuart. This great volume is filled with statistical information regarding the mineral production of the United States for 1902. The book deals with figures on amount and value of minerals produced, localities, number of men engaged in the industry, wages received and power employed. Most of the figures are presented tabularly and diagrammatically. On the whole, the work shows great care in preparation and the facts seem to be trustworthy. Little is published, except the statistics as to labor, that has not already appeared in other government reports. It is to be regretted that statistics for the year 1902 cannot be made public before 1905, for in this time many changes have been made in this industry and the facts here presented cannot be taken as a criterion of present conditions. This criticism has been made of the work of the United States Geological Survey, but this census report appears more than a year after the Survey's report for the same year.

## Trade Treatises.

The Wellman-Seaver-Morgan Co. of Cleveland, Ohio, describe the advantages of the Johnson patent arch plate in an illustrated leaflet.

No. 32 catalogue from Woodin & Little, 312-314 Market street, San Francisco, Cal., describes that firm's line of gasoline engines, pumps, windmills and tanks.

## Latest Market Reports.

SAN FRANCISCO, March 17, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, har silver, 58½c, refined (1000 fine); San Francisco, 58½c; Mexican dollars, 48½c, San Francisco; 45c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37½; Electrolytic, 1 to 3 casks, \$15.37½; Casting, 1 to 3 casks, \$15.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18½c. London: £68 11s 3d spot per ton.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 5s 3½d long ton.

SPELTER.—New York, \$6.25; St. Louis, \$6.15; London, £23 17s 3½d; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.37½; 29.75; San Francisco, ton lots, 30c; 500 lbs., 30½c; 200 lbs., 30½c; less, 31c; bar tin, 32½c. London, £134 17s 6d.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75¢ to 82¢ per gram.

QUICKSILVER.—New York, \$40.00 to \$41.00 large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb lots, 19.75c; San Francisco, Plumbers', 100-lb lots, 16.50c.

ZINC.—Metallic, chemically pure, 50c; dust, 40c; 10c; sulphate, 40c.

NICKEL.—New York, 55¢ to 60¢ per lb.; ton lots, 40¢ to 47¢.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31¢ to 34¢.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35 to \$16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$23.00 to \$27.00; open hearth billets, \$23.00 to \$27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ¾c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ¾c per lb. above keg price.

Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00 to \$5.00; extra sizes higher; redwood, \$28.00 to \$30.00; latb, 4 eet, \$4.50 to \$5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00 to \$35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15 to \$2.65 per bbl.; California, carload lots, \$2.10 f. o. b. at works; small lots, \$2.40 per bbl. in sacks, 4 sacks to bbl., 10c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300 to 500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumherland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-

glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\* 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50 to \$6 per 1000; 4x, \$6.50 to \$7; 5x, \$8 to \$8.50; Lion, \$9 to \$9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23 to 24c per lb.; carloads, 23 to 23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; byosulphate of soda, 3 to 3½c per lb.; caustic soda, in drums, 3 to 3½c per lb.; Cal. s. soda, bbls., \$1.10 to \$1.20 per 100 lbs.; sks., 90c to \$1.00; chlorate of potash, 12 to 13c; nitrate of potash, 6½ to 7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½ to 2¾c; powdered sulphur, 2½ to 2¾c; flour sulphur, French, 2½ to 2¾c; alum, \$2.00 to 2.25; California refined, 1½ to 2c; sulphide of iron, 8c per lb.; copper sulphate, 5½ to 5¾c; chloride of lime, spot, \$2.50 to 2.75; sulphuric acid, in carboys, 66% B, 1½ to 2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, boiled, bbl., 60c; cs., 65c; raw, bbl., 58c; cs., 63c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw, bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As; tral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c, Elaine, 25c; Water White, in bulk, 12½c; Mineral Seall iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c, do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naptha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; 78c; Sperm, crude, 63 to 68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52 to 57c.

BORAX.—Concentrated, 6 to 7c per lb.; powdered, 8 to 10c; fused, 20 to 25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5 to 6c per lb.; No. 1, 4 to 5c.

LITHARGE.—Pure, in 25-lb. bags, 8 to 9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, per lb., 80c.

PHOSPHORUS.—American, per lb., 70c.

SODIUM.—Metal, per lb., 50c.

BISMUTH.—Subnitrate, per lb., \$2.10.

URANIUM.—Oxide, per lb., \$3.50.

MERCURY.—Bicarbonate, per lb., 77c.

TUNGSTEN.—Best, per lb., \$1.25.

SILVER.—Chloride, per oz., 90c to \$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Per lb., \$2.75.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$3.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MARCH 7, 1905.

784,202.—TELEPHONES—Andriano & Herbstreit, San Francisco.  
784,203.—TEAM DRIVER—Arnold & Kress, San Francisco.  
784,204.—METAL CUTTER—C. C. Atkins, Los Angeles, Cal.  
784,475.—AWNINGS—T. J. Daniels, San Francisco.  
784,252.—PULLEYS—Dethlefsen & Grah, San Francisco.  
784,389.—VALVE GEAR—W. F. Diden, Santa Monica, Cal.  
784,039.—SAD IRON—M. E. Fallon, Spokane Wash.  
784,257.—TRAIN GUIDE—P. Flanagan, San Francisco.  
784,258.—GARMENT FASTENER—F. Franz, San Francisco.  
784,153.—HAME HOOK—T. G. Gordon, Madras, Cal.  
784,211.—BLOTTING PAD—C. J. Hasman, San Francisco.  
784,213.—TRACE HOLDER—C. Heilrath, Sacramento, Cal.  
784,214.—TRACE HOLDER—C. Heilrath, Sacramento, Cal.  
784,490.—SHADE BRACKET—C. Heilrath, Sacramento, Cal.  
784,405.—WASHING MACHINE—P. P. Klef, Oakland, Cal.  
784,219.—BOTTLE FILLER—F. J. Lewis, Sacramento, Cal.  
784,058.—CLOBE—Manson & Conick, San Francisco.  
784,152.—SPIRIT LEVEL—H. N. Northolt, San Francisco.  
784,120.—CYANIDE TREATMENT—E. L. Oliver, Oakland, Cal.  
784,421.—STRING CUTTER—E. H. Painter, Alpha, Wash.  
784,348.—SAWING MACHINE—B. J. Pve, Astoria, Or.  
784,124.—HARDENING IRON—F. L. Ramon, San Francisco.  
784,179.—ROTARY ENGINE—C. P. R. Roy, Stirling City, Cal.  
784,227.—SEARCHLIGHT—B. C. Riblet, Spokane, Wash.  
784,154.—OIL BURNER—L. B. Rosen, Los Angeles, Cal.  
784,230.—HAY RAKE—S. Roth, Winnemucca, Nev.  
784,505.—INJECTOR—A. C. Rush, Los Angeles, Cal.  
784,436.—OIL FEEDER SYSTEM—R. F. Schroeder, Sacramento, Cal.  
784,126.—OIL BURNER—J. Schurs, Los Angeles, Cal.  
784,184.—SAWING MACHINE—G. F. Sehrl, Alsea, Or.  
784,438.—CURLING IRON—G. F. Shields, Kern, Cal.  
784,076.—CUP HOLDER—J. W. Shute, Iternia, Cal.  
784,428.—OIL BURNER—Smith & Dietz, Tucson, Ariz.  
784,445.—PIPE CUTTER—F. M. Sylvester, Hamilton, Wash.  
784,240.—WOOL WASHER—J. H. Tillenbush, Stockton, Wash.  
784,083.—BRIQUET PRESS—J. Treadwell, San Francisco.  
784,452.—WIRE STRETCHER—F. Verhoeven, Forest Grove, Cal.  
784,527.—PEELING FRUIT—C. J. Vernon, Fresno, Cal.  
784,455.—FEED RACK—G. R. Warren, Spokane, Wash.  
784,018.—TELEPHONE—W. D. Watkins, San Jose, Cal.  
784,199.—BOTTLE—O. Yates, Portland, Or.

## Notices of Recent Patents.

SM

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

GARMENT FASTENER.—No. 784,258. March 7, 1905. F. Franz, San Francisco, Cal. This invention is especially designed for securing parts of garments and attachments thereto. It consists in fitting an independent elastic ring of peculiar construction to encircle a stem or shank, so that when said stem or shank is introduced into a socket of a companion part the edges of said part will clasp the ring while the latter is freely turnable about the stem, and such devices may be used for connection of parts of clothing or other equivalent purposes.

STEAM DRYING DEVICE.—No. 784,293. March 7, 1905. H. V. Arnold and A. H. Kress, San Francisco, Cal. This invention relates to a device especially designed to separate steam from water with which it is associated in steam boilers and the like and to produce a substantially dry steam for use. It consists, in part, of a ring fixed to a steam discharge pipe, a plurality of rings and intermediate screens at the inlet to said pipe, a pan underlying the lowermost ring, means for drawing the pan from the inlet ring and bolts passing through the pan and the rings and screwed into engagement with the first named ring, and other details of construction.



# MINING AND SCIENTIFIC PRESS

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Number 12.

SAN FRANCISCO, CAL., SATURDAY, MARCH 25, 1905.

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## Cyaniding in Mexico.

Some of the largest and most successfully operated cyanide plants in the Western Hemisphere are in Mexico. The accompanying illustration is that at the Peregrino (Pilgrim) mine, 8 miles west of the city of Guanajuato. The ore carries both gold and silver, and is what would generally be considered low grade, though ore of high grade is also found in it. The mine has extensive development, and was worked years ago by Mexican owners, but, failing to yield a profit by the native methods in vogue at that time, was closed down and remained idle for years. In 1903 W. H. McCord of Nevada City, Cal., went to Mexico on mining business and, being in Guanajuato, heard of the Peregrino mine, investigated it, and, arranging with the owners a price and what he considered reasonable terms, interested American capital and reopened the old mine. Kinkead mills and a complete cyanide plant were

put in, the latter being the subject of the illustration, from a photograph taken for the Redwood Manufacturers' Co. of San Francisco, Cal., who furnished the equipment. It is arranged to work, as far as possible, on the gravity plan, and under existing conditions of climate, price of labor, and character of material to be treated, has been called by some who have seen it a model plant. It differs in some respects from the ideal plant in the United States, but the

low cost of labor evidently justified some of the unusual features of construction and method of operating.

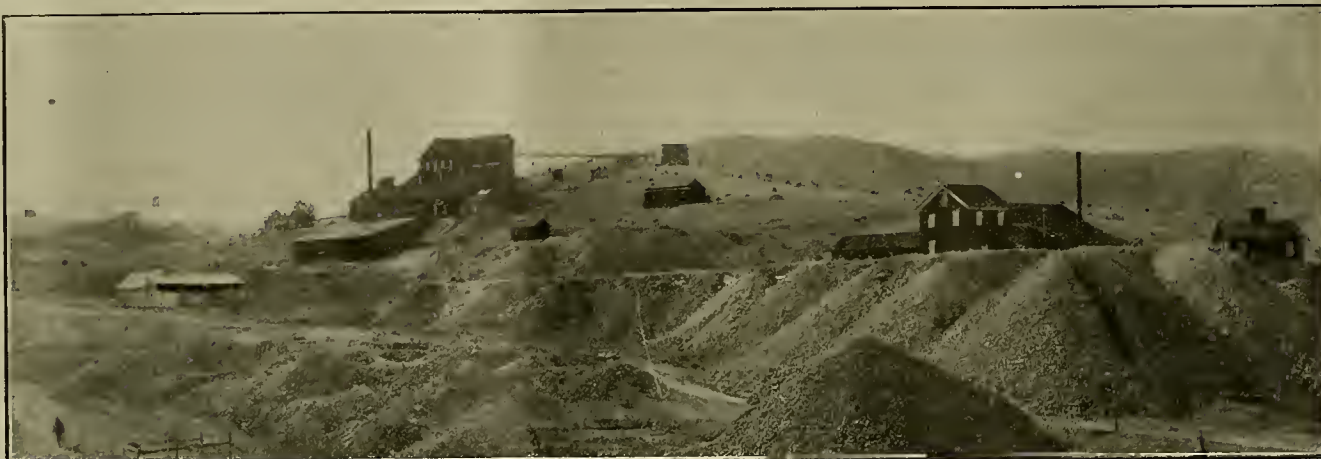
It is reported that this property was recently sold to a new company for \$480,000, and the new owners

have taken possession. There is a large amount of ore in sight, which, with improved American methods, should yield a good profit. There are many mines in Mexico lying idle which, with proper equip-

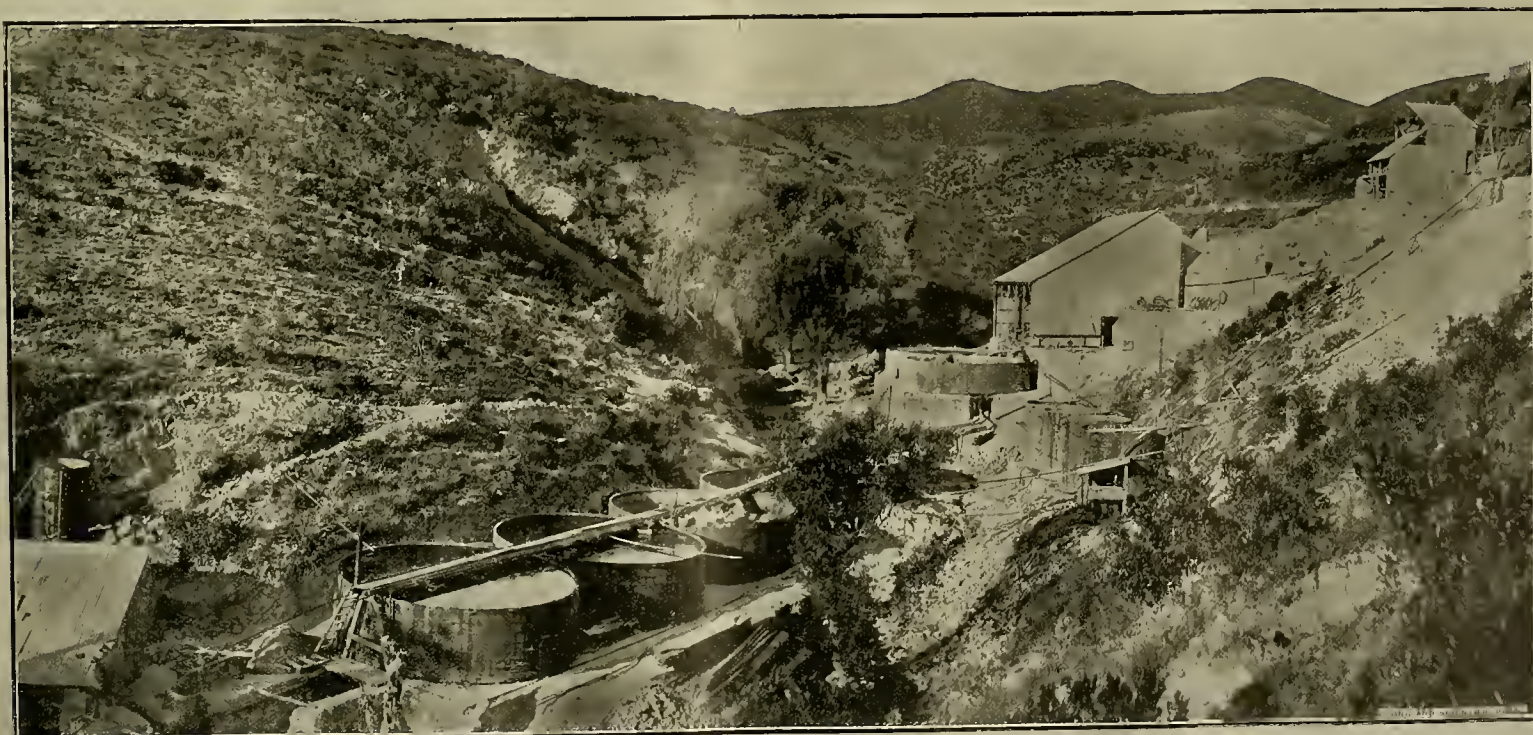
ment and operation, could be made dividend payers, but those contemplating investment in these properties should "take nothing for granted," for the Mexicans themselves have reputations as good miners.



Bird's-eye View of Tombstone, Ariz. (See Page 189.)



Some of the Mines at Tombstone, Ariz. (See Page 189.)



Cyanide Plant of the Peregrino Mine, Near Guanajuato, Mexico.



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## The Latest Mining Rush.

The first of a series of privations and hardships suffered by stampedeers into southern Nevada from California is reported. It is stated that the trails leading to Goldfield via Death Valley from various points along the railroad in southern California is lined with all sorts of outfits bound for the new gold mines. Water is scarce, and only obtainable at a few springs and wells situated at long distances apart. It costs ten cents at roadside houses to water stock and a dollar a meal for travelers. Hay is sold in small amounts at prices ranging from \$30 to \$60 per ton. The desert roads—never good at best—are now in deplorable condition, owing to extensive washouts. The roads are lined with dead horses and mules, and the unfortunate losers of these animals have either made arrangements to go forward with others or have turned disgustedly homeward, hastening to try again. In some instances the more foolhardy are attempting to walk, taking chances on getting to the new El Dorado. It is no new thing to meet with hardship and discomfort on a mining stampede in a country well timbered and watered, and where life is endurable, if food can be obtained at all, but a stampede across a desert amid rugged and verdureless hills, through deep sands or floundering in the clayey muck of a desert sink, is quite a different matter—and those who have not had experience on the desert undertake a risky task when they attempt to cross the desert from Mojave or Daggett, or any intermediate point in California to the Goldfield region of Nevada.

## Value of a Mine Report.

There is a great range in the value placed on a mine report made by different men and there is as great a difference in the actual value of reports made on the same property by different men. Mine reports are made for various purposes, not infrequently for the purpose of the owner, who wishes to obtain the facts, having a bearing on the workings of his mine and the treatment of the ores, or as a means of ascertaining the actual value of the property, present and prospective, but more often the report is intended as a basis of fixing a selling price on the property or for the purpose of raising money to equip and further develop it. In the latter case the opinion of the man whose report will sell stock is the one that is wanted. In the former case this is a consideration of less importance. Some months since a mine promoter employed an engineer to make an examination of a mine which had been extensively equipped and developed, and which had produced considerable money, but in a spasmodic manner. The engineer made a careful examination, accompanied the greater part of the time by the promoter. When the examination had been completed a verbal report was made to the effect that the mine did not possess the elements of success. The promoter acknowledged that the situation looked discouraging, and said he understood it fully; that the verbal report would be sufficient. The engineer was paid, and, so far as he was concerned, the matter was dropped. A few days later another man of some reputation appeared at the mine, and the promoter explained to his engineer that he had come in a consulting capacity. A few days later the further information was volunteered that the second engineer would make a written report, which he did. Many thousands of dollars was raised with its aid, a larger mill built and a new period of activity inaugurated, but it was the last spasmodic effort. The mine failed to meet the promise of the report and was closed down and remains so still. Comment on an instance of this kind is unnecessary. The engineer whose reports become of greatest value is he whose opinions as expressed in his reports are verified by actual results, whether these be good or bad, and no engineer who seeks permanent good standing can afford to allow friendship or any other consideration to stand in the way of making his reports in absolute accordance with the facts.

## Broken Hill Report.

The half-yearly report to December 1, 1904, of the Broken Hill Proprietary Co. of Broken Hill, N. S. W., recently issued, shows that during the period covered by the report 324,535 tons of ore were mined, and that 79,158 cubic yards, or about 160,000 tons, of waste were broken in the open cuts to fill stopes below. A great deal of attention has been given the past two years at Broken Hill to the concentration problem. At the concentration works over 300,000 tons of sulphides were treated, and the cost of concentration per ton reduced, it is said, owing to the large quantity handled, and a closer saving of lead and silver effected by exercise of greater care. For years the zinc ores occurring so abundantly in the Broken Hill mines had no market, and particular attention was given this problem during the past two years. Several different schemes for the separation of zinc sulphide from the galena and iron have been tried, most prominent among them being the salt-cake process, an invention of G. D. Del Prat, the general manager, and magnetic separation. The report states that as particularly favorable results were obtained by the salt-cake process, magnetic separation was temporarily suspended. Nearly 28,000 tons of mill tailings were treated by the salt-cake method, resulting in 8104 tons of high-grade zinc concentrates. The tailings were conveyed to the open cut and sent through chutes into the stopes below. This is an innovation and is doubtless permissible in a dry mine. What the result of the adoption of this method would be below the water level is speculative, but it is reasonable to assume that it would be found most difficult to restrain the sands, which, when saturated with water, would run badly and probably fill the lowest workings. This company about a year ago put in an acid making plant, and during the half year under discussion enlarged the plant. With one

chamber 400 tons of sulphuric acid was produced. This acid—a by-product, as it were—is employed in the Del Prat salt-cake process, and as the raw materials are largely produced by the mine, the process is cheaper there than other methods requiring power in their operation. The Broken Hill mines are situated in a semi-desert country, where the rainfall is light, and usually all falls within a short period, in the form of heavy showers, sometimes approaching the character of cloudbursts. The source of supplies is distant and everything about the mines is taken advantage of, and as a result costs are reduced far below what they were in former years, when the ore was higher in grade, nearer the surface and easily treated by smelting.

## A New Inland Sea.

The Colorado river is reported overflowing its banks below Yuma, and a great flood is pouring into Salton basin in the Colorado desert, in San Diego county, Cal. The fear is entertained by many that the basin may again become a great interior lake, as it once was. The Salton basin is below the level of the sea, the old shore line being plainly visible for many miles around the basin. The area included within that portion lying below the normal level of the Colorado river at the breach which that stream has made in its west bank is about 4000 square miles, and owing to the tremendous absorption of the desert sands, and the high evaporation factor, if the river were to pour its entire flood into the basin it would require twelve to fifteen years to fill it to the old shore line level. What effect such an event would have on the climate is speculative, but much railroad property would be submerged and many miles of track would have to be torn up or abandoned, and the line built on higher ground, but there is little fear of such a result unless the work of the river is aided artificially to accomplish this. The Colorado river is rather higher than usual at this time of the year, and it is said that the breach was made by irrigators who opened their main ditch directly to the river. Should the river maintain its present high stage—and this is likely to be increased by melting snows in the Rocky Mountain region—the river may do much damage to the salt works and railroad property in the lowest part of the basin at Salton. It is now nearly fourteen years since the Colorado river overflowed into the basin through what is known as Hardy's Colorado or New river. The river is said to be higher now than at that time. Although great damage would result should the basin again become a lake, it would undoubtedly be of benefit to the mining industry in that part of California, as there is a great scarcity of water there and the lake would afford both abundant water and cheap transportation facilities.

THE Keswick smelters of the Mountain Copper Company, in Shasta county, Cal., will be blown out as a result of the recent decision finding for the Government against the copper company for damages to trees and other vegetation in the neighborhood of Keswick. The company has given notice to the several mines which have supplied the smelters with siliceous ores for flux that no more ores will be received. An interesting phase of the situation about Keswick lies in the fact that many of the trees in the damaged district are showing renewed signs of life, and reports from Happy Valley, one of the affected districts, are that the fruit trees and grass are flourishing this year, and even the pine trees are again bearing cones. This is thought to be due to the fact that the practice of heap-roasting has been discontinued at the smelters for several years past, and also partly to the fact that the rainfall has been more abundant this year than usual.

THE application of electricity to mine drainage through the medium of electrically driven pumps is becoming recognized as possessing some advantages over other methods in certain cases. What the limitations of electrically driven pumps, as applied to mining uses, will be, remains to be determined. An installation in Germany consisting of two electrically driven pumps raises 1500 gallons per minute a height of 1700 feet. This is said to be accomplished with a combined efficiency of 58%. The efficiency of the pump alone is stated to be 77%.



## CONCENTRATES.

THE chloride of gold in nature is a myth, no authenticated instance being cited by authorities.

CHLORINATION of auriferous sulphides at some California mines has been discontinued for shipment to smelters.

IN putting up a long raise it is always advisable to meet it by sinking from the level above. It will in most cases prove the more economical plan.

THE largest mass of gold discovered in California is said to have weighed 2340 ounces. It was taken from the Bonanza mine at Sonora, in Tuolumne county.

THE bonanzas of the Comstock Lode at Virginia City, Nev., appear to have been formed at a later period than the immense masses of quartz in which they occur.

ZINC BLENDE is often rich in gold or silver, or both. The zinc ores of Missouri and the other fields of the Mississippi valley contain little, if any, silver or gold.

IT has been asserted that chlorides and silicates of gold exist in nature, but so far as known to "Concentrates" there are no authoritative records of such occurrence.

THE pay shoot of the Smuggler-Union mine, near Telluride, Colo., is described as being over 5000 feet in length and has proved profitable throughout that distance.

TANTALUM is an element and a metal. Tantalite is a tantalite of iron and manganese having the formula  $\text{FeMnTa}_2\text{O}_6$  and is sometimes accompanied by cupric oxide and lime.

IT was first proposed to treat copper mattes by the Bessemer process as early as 1866 in Germany, but no progress was made in the practical application of the idea at that time.

THERE is no law or apparent relation between the strike and dip of a vein and its value, though there is often a marked difference between veins in the same district having a different strike and dip.

THE silver in the mine at Running Water, near Lusk, Wyo., is mostly native and occurs in a stratum of Cambrian quartzite lying on Archean schist. The quartzite is stained with thin incrustation of copper carbonate.

DRIED mill tailings may be used for filling in a dry mine; but their use is not advised in a wet mine, for the wet sand is sure in time to run and give much trouble at points lower than the stopes which have been filled in this manner.

AN extensive description of the Silver Islet mine, in Lake Superior, will be found in the Transactions American Institute Mining Engineers, Vol. VIII (1879), page 134 et seq., which may be found in almost any public library in a large city.

SAMPLES of selenite (a transparent variety of gypsum) are frequently sent for identification in the belief that the mineral is mica. A very simple test is to lay a piece of the mineral on a hot stove. If it is selenite, it will soon turn white and become opaque.

CONCENTRATES which are to be treated after roasting by the chlorination process should be as clean as possible, particularly where the gangue contains considerable lime or magnesia, as these substances unite readily with chlorine and make the process more expensive.

THE present rate of coal consumption in the United States is 1,000,000 tons daily. While it is probable that even this vast amount will be largely increased, it is not believed that there need be any serious thought given to the probable diminution of the supply during the present century.

THE lowest grade of copper ore which may be successfully smelted depends much on surrounding economic conditions—availability of fluxes, cost of fuel and transportation and on the cost of labor. Copper ores have been smelted in British Columbia in the Boundary district, it is reported, for less than \$3.50 per ton.

GALENA and CARBONATE OF LEAD (cerussite) are the principal sources of the lead of commerce. Wulfenite, anglesite, pyromorphite and the several antimonial lead compounds are relatively unimportant. Metallic native lead is reported from a few localities, but native zinc, so far as known to "Concentrates," is unknown.

THERE is no particular device on the market, so far as known to "Concentrates," designed to separate gold from black sands of ocean beach or river. The numerous types of concentrators may effect a partial separation, and inclined tables covered with hurlap are sometimes used for this purpose. Several years ago an amalgamator was made in San Francisco, Cal., which was

essentially a slightly inclined revolving cylinder, having diaphragms or wings, arranged longitudinally within it. The gold-bearing sand was introduced at the upper end, and the sand discharged at the lower end, the greater part of the gold remaining attached to the amalgamated plates within the machine.

SALT WATER and water containing other minerals in solutions have been successfully used in amalgamation and to some extent in cyanidation, particularly the latter. As far as known to "Concentrates," neither sodium chloride nor sodium carbonate in solution in battery water have a bad effect on amalgamation, though waters containing arsenic and free sulphuric acid are known to be detrimental to close amalgamation.

WHEN the only available water for steam making contains sodium chloride or sodium carbonate or other mineral salts which interfere with steam making, the best way to overcome the difficulty is to condense the salt water and use only distilled product in the boiler. This was done extensively in West Australia prior to the completion of the great Kalgoorlie pumping system, as salt water was the only kind available in that region.

PUMPS of various design have been employed to "suck up" gold-bearing material from deposits situated below the water level, but the wear on reciprocating pumps employed for this purpose is heavy. More recently pumps and dredgers operating on material of this kind are of the centrifugal type. The parts subjected to the greatest amount of abrasion are made of very hard steel and are readily replaced by new parts when worn.

DIABASE is frequently found associated with gold-bearing veins, but rich veins are accompanied by other intrusive rocks as well as diabase, and within them. Ore shoots are known to occur with nearly every kind of intrusive rock known, from the most acid granite and felsite to basalt. The association with the latter is of comparatively rare occurrence, the most noted instances of this kind being in the Cripple Creek district of Colorado.

EXHAUST STEAM conducted through good-sized galvanized iron pipes 2 feet or more in diameter and placed beneath the battery plates or in front of them will warm the mill sufficiently. A coil of pipe in the mill tank, through which a small amount of live steam is passed, or even exhaust steam, will warm the battery water sufficiently in the coldest climate. Battery water for the best work should be between 50° and 55° F. It is not necessary or advisable to have it even lukewarm.

COPPER SULPHIDE ORES may in many cases be changed to sulphate in an inexpensive manner by spreading them out in beds and leaching and re-leaching them with a saturated solution of brine containing ferrous sulphate, which latter is a by-product of the precipitation of the copper. This process facilitates the decomposition of the sulphides, with the formation of sulphates, but it is a very slow process, often requiring several years, and even then the extraction of the copper is incomplete.

WHERE placer gold is found in gulches or on flats, where no gold-bearing veins or pockets can be found, the natural conclusion is that the gold must have been derived from some distant source, even though the topography of the country about may appear to controvert the correctness of this theory. Gold is not infrequently found in gravel on hilltops where it was deposited before the hill was created by the erosion of the surrounding rocks.

THERE is some difference of opinion as to the proper succession of the drop of stamps. The drop most commonly used in the United States is 1, 4, 2, 5, 3. In some districts of the United States and Australia the order of drop is 1, 5, 2, 4, 3. This order is said to scour the chuckblock plate and to cause more rapid wear of the screen. In some mills 3 of the 5 stamps of a battery are allowed to fall almost simultaneously, but it is not recognized as the best practice.

THE black sands in river beds, ancient and recent, are mostly iron. Some of the sand is magnetic and some is not. It is probable that the magnetic sand is due to the disintegration of greenstones and lavas in which magnetite is more or less abundant. Titanic iron is also partly from lavas and partly in some instances from granitic rocks. The remainder of the iron sand is in most instances limonite resulting from the oxidation of pyrite. The latter is often gold bearing.

THERE are a number of substances associated with gold in ores which render the gold difficult of amalgamation, for the reason that these substances coat the little particles of gold with a film which prevents a contact with quicksilver. Among these substances are talc, graphite, molybdenite and manganese oxide. The difficulty in most cases is mechanical and not chemical. When it occurs concentration should be tried and the floating scum of the undesirable minerals conducted off from a tank and settled under water.

WHERE the rocks through which a shaft is being sunk are hard and firm, it may be permissible to put in only sufficient timber in the form of plates or stulls to

carry the ladder ways, pipes and guides, or track, but if the shaft is intended as the main working shaft, through which a large amount of ore is to be hoisted, the opening should be substantially timbered throughout with the usual shaft sets. In the case of firm solid ground, as described, these sets may be placed 6 or even 7 feet from center to center instead of 5 feet, as usual.

THE grade of gold-bearing gravel which may be dredged with profit depends upon the cost of working, and this varies with the conditions. Some gravels may be dredged much more cheaply than others. The character of bedrock is also often an important factor. The prospecting drill may often recover from hard, rough bedrock, gold which can not be readily brought up by the dredger. The ideal conditions are a bank not over 60 feet deep, the gravel easily moved, and containing few boulders of large size, with a soft bedrock which may readily be cut by the dredger bucket, and brought to the surface.

THE exact temperature at which gold ceases to be attacked by chlorine and the rate of volatilization of chloride of gold are of importance in connection with the roasting of auriferous sulphides in the presence of salt. Rose in his "Metallurgy of Gold" claims that gold unites with chlorine if placed in the gas at atmospheric pressure at all temperatures up to a white heat, but the subsequent decomposition of the chlorine is rapid above 300°. The absorption of chlorine by gold with the formation of chlorides at first increases in rapidity as the temperature rises, and reaches its maximum at about 225° C.

MERCURIC CHLORIDE is employed in amalgamation in several patented processes. In what was known as the Designolle process a charge of 600 pounds of ore was placed in an iron barrel or pan, with the barrel or pan about one-half filled with water. To this was added one gallon of a solution containing 1.7% of mercuric chloride, one gallon of hydrochloric acid, and two gallons of salt, provided the ore did not exceed \$15 gold per ton. It was calculated to introduce to the charge ten parts of mercury to one of gold. The barrel or pan was rotated for about twenty minutes and then discharged into a settler, and the amalgam caught on copper plates.

COMPRESSED-AIR MOTORS are successfully employed in mine haulage at a number of places. At the Red Point mine, Placer county, Cal., the power is derived from the water flowing from the mine, which is collected and carried to a water wheel, which it operates under 600-foot head. The air pressure in the motor receiver, when freshly charged, is 700 pounds per square inch. This is sufficient to supply power to the motor to take the train into the mine on an upgrade. On coming out loaded, the train is controlled by brakes of the ordinary type, operated by hand. Originally, these brakes were controlled by compressed air, but it required about as much air to brake a train out as it did to haul one in by means of the motor, and the practice was discontinued.

THE expense of taking out a patent to a mining claim can not be arbitrarily stated, for the reason that the cost of several of the important items is not fixed by law. Generally speaking, \$300 should cover all the expense, including the cost of the land in one full quartz claim of twenty acres and about \$250 in the case of a single 20-acre placer claim. The fee of the United States Land Office is \$10, and in the office of the Surveyor General there is a charge of \$35 for stationery and office work and \$40 if the claim be placer. An abstract of title must be furnished, and the cost of this may vary greatly, from \$10 to over \$100, depending on circumstances. The cost of publication is not fixed, nor are the attorneys' fees, and these may vary greatly. The United States Land Office in California has given the following figures as approximating the cost of patenting a quartz claim: Payment of the land, twenty acres at \$5 per acre, \$100; Surveyor General—Deposit, \$35; publication notice, \$25; affidavits, etc., \$5; deputy surveyor, \$40; land office fee, \$10; total, \$220. To this must be added attorney fees, publication notice, abstract of title and other incidental expenses.

TO QUICKLY HANDLE a steam pump in a shaft, the steam and discharge pipes should be provided with slip joints at least 20 feet in length, and the exhaust should be conducted into the sump. By means of the slip joint the pump may be pulled up at least three sets and protected by a bulkhead when ready to blast. It is also desirable to connect the column pipe by flange joints instead of the ordinary couplings. Rubber hose soon vulcanizes and is unsatisfactory where the steam must be turned off from time to time, as must be the case when the pump is stopped to blast or from any other cause. Where a station has been cut, or a tank provided at one side of a shaft, the water coming down the shaft may be caught on the timbers by means of narrow slats tacked on the upper face of the timbers close to the inner edge, and these, with the aid of small clay dams, will turn the water inward toward the walls, where it may be caught up and conducted to the tank and either sent out by skip or pumped to the surface by a stationary pump. By catching up the water at various levels in the shaft, the sinking pump in the bottom is relieved of much of its duty and can be utilized to better advantage.

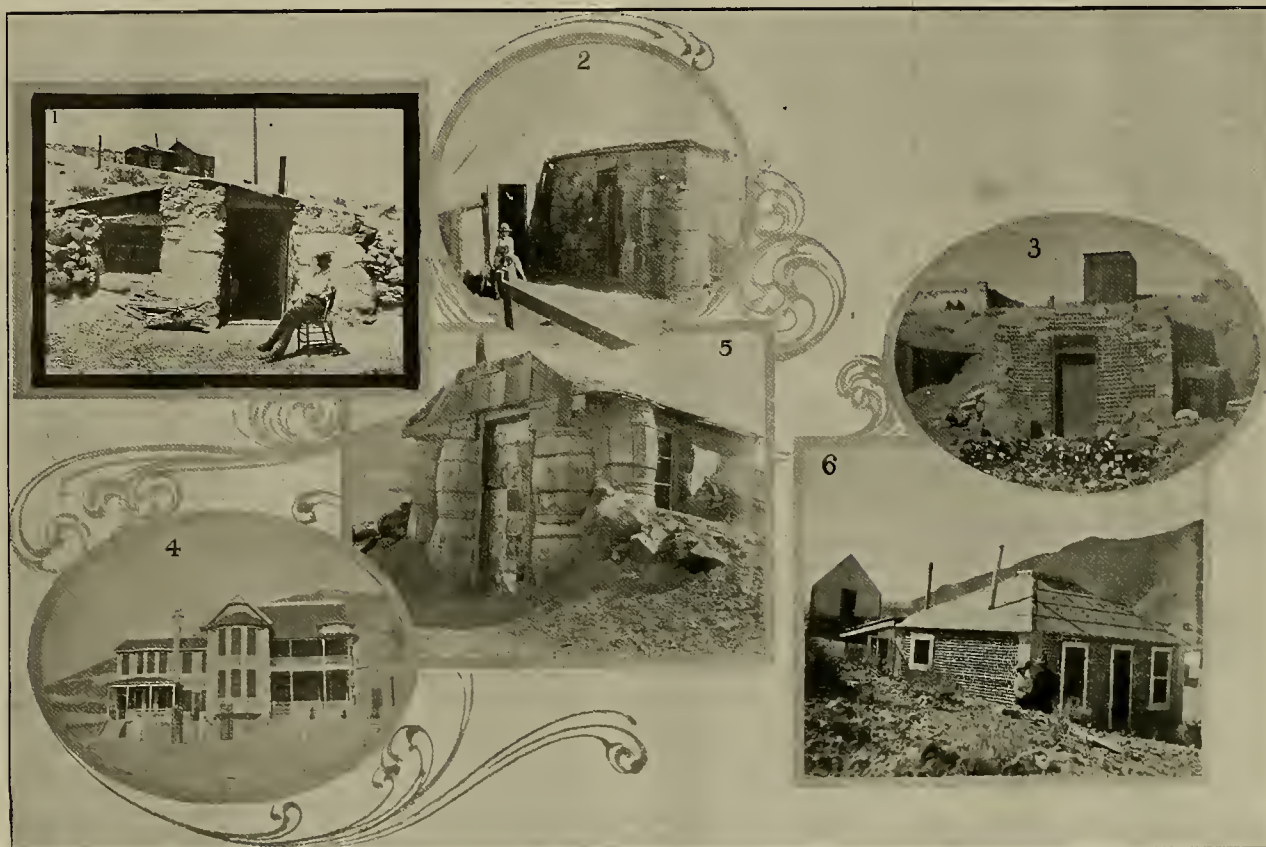


### The Mines of Tonopah, Nev.

The recent unusual activity in southern Nevada dates back to the discovery of the Mizpah mine by J. L. Butler in May, 1900. The locations were perfected the following fall. After being worked by leasers—there being thirteen blocks—this claim, to-

vein outcrop, prospecting about Tonopah, though not lacking in vigor, was necessarily uncertain. The ore-bearing formation (andesite) was found overlaid throughout the greater part of the district by later flows of volcanic material, the only exposures of vein apex being in a comparatively limited space which had been exposed by erosion. Still so active and de-

which are scattered about the landscape without system or regularity. This is evident by a glance at the accompanying illustration of the town of Tonopah and surrounding hills. The several hills and ridges are separated by rolling or sloping country covered with coarse sand and supporting a scattering growth of sagebrush. Not a tree of any de-



Styles of Architecture Found at Tonopah, Nevada.



Bird's-eye View of Tonopah, Nevada.



We Hope Mine, a Prospect near Tonopah, Nevada.



Montana-Tonopah Mine, Tonopah, Nevada.

gether with the several other claims of the group, passed by purchase to the Tonopah Mining Company, Jan. 1, 1902. During the period immediately following the recognition of the value of Butler's discovery, with which he was not much impressed himself at first, hundreds of locations were made, and thousands of feet of shaft and other underground development has been made. Owing to the limited exposures of

terminated was the work of exploration that several mines have, in the course of their development, struck veins of rich ore.

The region in which Tonopah is situated may readily be recognized by an experienced geologist or prospector as of volcanic origin, by its topography. It consists of a series of elevated mesas which have been cut by erosion into detached or connected hills,

scription in sight. The town is at an altitude of 6000 feet and the highest elevation in the district is Mount Butler, 7160 feet.

There are no true sedimentary rocks in the district, though limestones and older eruptive rocks—granite and diorite—are known both north and south of Tonopah. In the immediate vicinity of the town all the rocks are of volcanic origin, either massive



eruptions or tuffs. The oldest rock outcropping in the district, although much altered, still retains sufficient of its characteristics to make its identification possible. It is hornblende andesite, an abundant Tertiary eruptive in the Great Basin region. This formation was subjected to much movement and fracturing, together with the crushing of zones of greater or less width along the lines of fracture, and in these zones the mineralization took place. In appearance the ore resembles that of the Comstock Lode, at Virginia City, Nev.

Later eruptions of andesite followed the fracturing of the andesites of the first period, this later andesite being more basic than the former, and may be termed augite andesite.

Still later eruptions of rhyolite, a quartz-bearing trachyte, and of dacite, quartz-bearing andesite, followed the later andesite eruptions. No mineral veins or deposits have thus far been reported as having been found in any of these eruptives occurring later than the first flow of hornblende andesite. As these later rocks covered the entire region, only those portions of the earlier andesite, the ore carrier, are easily accessible which have been exposed by erosion. This will convey an idea of how uncertain prospecting in this district is, outside of a small area in which are the producing mines.

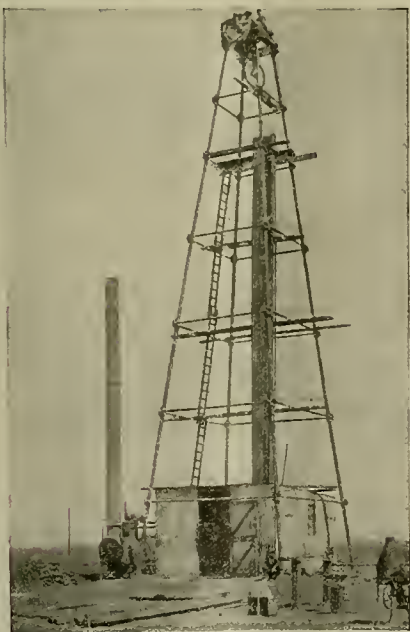
The main shaft of the Mizpah mine is down over 900 feet. The main workings are above the 600 level, and but little crosscutting has been done below the 600. The deepest workings on the vein are said to be at 540 feet, where a hanging wall drift has developed a vein 3 to 8 feet wide of high-grade ore, but the full width of the vein at this place has not been determined.

The Desert Queen shaft is down 1100 feet. It is a quarter of a mile east of the Mizpah main shaft. The Mizpah vein is stated to continue through the Desert Queen and Belmont ground, where it is about 6 feet wide, several hundred feet from the surface. There are several shafts sunk all the way in ore on this vein—the Brougher, down 700 feet, the Cutting and Lynch, each down over 300 feet. There are several other veins in the vicinity of the Mizpah vein, but as yet they have failed to produce the same high grade of shipping ore which has made the former lode famous. These outside veins, however, produce a good grade of ore, which will be milled in the local mills to be built in the district.

As in most other new mining camps of the West, Tonopah enterprise has exerted itself in the creation of distinctive and characteristic types of architecture, several samples of which are illustrated in the accompanying engraving. Here are seen a modern residence of substantial and homelike design; a house of bottles, and another built partly of bottles and partly of stone. Two others have been constructed of barrels, gunny bags and old tin cans, while another is more substantial and is built almost wholly of stone. In the desert city, frame houses and tent houses are to be seen by the hundreds. The mine improvements, however, are mostly of a substantial kind, and in some instances of higher class than are usually found in a mining district in the prospective stage of development.

### Deep Drilling in South Africa.

Diamond drilling as a means of locating the gold-bearing reefs of the Transvaal has been in general practice for many years. Unusual interest attaches



Boring a Hole 5560 Feet Deep.

this work larger and larger drills have been used, and within the past year or two enormous boreholes have been bottomed in ore at depths of from 4500 to 5000 feet. Over 300 diamond drills are now in use in South Africa. The mining companies, as a rule, let the work to contractors, who furnish all the equipment and expert operators, and deliver the core into the hands of the company. American companies have recently broken all records for depth. James Tobin completed a borehole last December at Doornkloof, 16 miles west of Randfontein, at a depth of 5560 feet. This hole was sunk to prove the main reef series, and it is understood that the results are conclusive, although they have not been made public. The deflection was very slight. The first 3200 feet were bored with a Sullivan size "N" drill, rated capacity 2000 feet. A size "P" drill, with a rated capacity of 4000 feet, was then put in commission and continued the hole until its completion at 5560 feet. Seven hundred feet of size "N" rods, removing 2 inch core, were used, the remaining 4860 feet being "B," removing a 1½ inch core. The total load of these rods was between fifteen and sixteen tons, which was handled by the engine without difficulty. The actual running time of this hole was fourteen months, or an average of nearly 400 feet per month. For the first two months two ten-hour shifts were used, and for the remainder of the time the work was carried on throughout the whole twenty-four hours, divided into three eight-hour shifts. The rods were pulled in lengths of 50 feet, the height of the tubular steel derrick being 66 feet over all. The time required to lower the rods at a depth of 5000 feet was from three to three and one-half hours, and from three and one-half to four hours were required to lift them. Herewith is illustrated the surface rig of this deep borehole.

This record has since been bettered by a hole sunk near springs east of Johannesburg, by John Skenke. This hole was begun May 1, 1904, and completed February 2, 1905, at a depth of 5532 feet. A size "P" drill was also used here, power being supplied by a 30 I. H. P. boiler. One thousand feet of "N" (2-inch core) rods were used, the remainder of the equipment being similar to that used by Tobin.

### The Walker River District, Nevada.

Written by DWIGHT T. SMITH.

The region about upper Walker river, Nevada, in a southerly direction from the village of Wabuska, has been described in a Bulletin of the Department of Geology of the University of California. The region is 30 miles east of Lake Tahoe and 20 miles southeast of Virginia City. In that section are a number of ore deposits which are described by the author of the Bulletin as follows:

**THE ORE DEPOSITS.**—The deposits of value carry copper and gold, but the two metals are not associated with one another in pay values. The richest copper deposits carry no gold, except perhaps as a trace, though occasionally a gold bearing vein contains copper, but not in values sufficient to warrant treating the ore for that metal alone.

**GEOLOGY OF THE DEPOSITS.**—In considering the general geology of the region the mineral veins are conformable to either one or the other of the main structural features of the region, and such being the case, it would seem that they were consequent upon the inauguration of these systems, but it is not to be inferred that they were formed subsequently to all the structural features. In fact, there seems to be very positive evidence that they preceded the present topography, which stands as a record of the later stages of deformation. In some instances there are a few veins that do not conform to either system.

That the mineral veins have preceded the present topography seems quite clear, and this is thought to be so for two principal reasons, which are, the absence of the veins from the rhyolite and the fact that the veins often reach to the highest summits. The latter condition would indicate that there is not now sufficient hydrostatic head under present conditions of surface configuration to bring the solutions from which the veins were formed to their present height. It may be remembered in connection with the first of these reasons that previous to the advent of the rhyolite the region was reduced to one of tolerably low relief. This evidently indicates that the vein formation was not active at the surface, and it was not until the later Tertiary, when the present ranges had been lifted and erosion had begun its work of uncovering them, that they became exposed.

The period of formation of the veins closed with the making of the present mountains in the Tertiary, but when it began is not so clear. Most likely it was after the effusion of the early andesite, for in one instance an andesite dyke forms one wall of a vein. It appears that no andesite remains residual near the metamorphics in which the strongest deposits of copper occur.

**THE DEPOSITS IN PARTICULAR.**—In a few instances the mining has progressed beyond the prospect stage. At the Ludwig copper mine a depth of about 400 feet has been reached. The ore occurs in chambers in limestone. These chambers when

taken together occur each more or less below the other, and when considered as a whole the idea of an ore chute nearly expresses their character. The chambers are along the contact between the iron ore deposit and limestone, which two occur as a simple outcrop having considerable length and a width of less than 100 feet. They do not meet squarely in this outcrop, but somewhat diagonally, hence there is a longer contact zone for the chutes. The rest of the country rock is granitic. The ores are sulphide, oxide and carbonate. At the Douglas mine the ore is chalcopryrite and chalcocite; the gangue is garnetiferous. About half of the ore is sulphide. It was apparently along the line of fracture that the ore solutions found their way. The country rock is in part almost wholly garnet and in part granitic, with small areas of limestone overlain. At the Blue Stoue mine the country rock is an almost entirely altered limestone. It is perhaps more than half epidote, and presents in the hand specimen a pale greenish gray color. This mass has been more or less fractured and refilled with calcite, in which the chalcopryrite is imbedded. The chalcopryrite is usually idiomorphic, at least it usually has one or two well formed faces. The rifts containing the ore betray some parallelism. The mine was named from a deposit of chalcantite (blue stone) which occurs near the surface. Farther south on this same ridge is the McConnell copper mine, where ore occurs mostly as an oxide. Oxidation has probably extended deeper there than any of the other places mentioned. Near this mine are several prospects, which usually are near a contact of limestone and granite. The deposits so far mentioned are all in or adjacent to the belt of schist. One reef of schist of a dark color, which is thus in contrast to the rest of the surrounding schist, crosses the summit transversely. In it there was found disseminated sulphides of copper and iron. The reef was supposed, on account of its strike and width, to be a dyke which had suffered along with the rest of the rocks the dynamic action which produced the schists. Sulphide was also found near the grano-porphry where it had been involved in the metamorphic action, but the sulphide did not appear to be so much disseminated as in the case of the dark reef.

Farther south of the McConnell mine gold occurs, and it also occurs in the Mason pass, to the north. There is also mineralization to some extent northeast of the Blue Stone mine, in the low hills near the west side of the river. East of the river are several veins of copper. They have a definite strike and dip, and are transverse to the summit of the ridges, and they occur along faults. There is not apparent the same amount of replacement of the wall rock or corrosion of the included breccia as in the case of the Ludwig and Douglas mines. Of these eastern ledges the Blue Jay has been most prospected. The mineralization in this case is confined to a belt about 200 feet wide along a fault. The ore, which at the surface is cuprite, occurs in cracks and fissures. The thin sections of the rock of this belt show more or less alteration of the rock and substitution of quartz which contains liquid inclusions. Sulphide ores make some appearance farther down in the prospect, and there has been considerable oxidation along the fault, and more particularly because it is vertical and in the bottom of a canyon. A hydrous copper phosphate, which the miners termed malachite, occurs in the mine, and from qualitative chemical tests made by the writer it appears to be libethenite; and from some goniometrical measurements made by W. T. Schaller of the United States Geological Survey it exhibits a few new forms. Also of some interest is the formation of chalcantite since the mining began. It appears to have formed in consequence of the steam which was introduced in diamond drilling. The remainder of the ledges occur from 2 to 6 feet wide, and the ore is much oxidized and leached. In some of the microscopic slides of the ores that have not been mentioned a very intimate relation of epidote to chalcopryrite is noticeable. The epidote occurs quite irregularly in outline, and the chalcopryrite tends to inclose it. The latter usually shows one or more quite distinct faces. This would seem to indicate that the chalcopryrite ceased to crystallize after the epidote and before the calcite or the quartz. In this connection it may be well to mention some of the considerations of a petrographical character that guided the writer in the study of the ores and their occurrence.

There appears as a corollary to many of the contributions to the subject of the formation of mineral veins, with respect to their structure, that relative idiomorphism and chemical phase cannot be regarded as having exactly the same significance that they have in the case of the igneous rocks. Their significance depends upon a different set of conditions. The banded structure frequently seen is due to a change in the solutions while the fissure is being filled; and as the filling starts on the walls and extends by successive layers or bands toward the middle, each mineral composing the layers is formed against a previous surface, and hence must have on one side the form of that surface. The other sides may not be freely developed on account of interference due to the minerals being contemporaneously grown. This is comparable to the allotriomorphic structure in granitic rocks. The bands may not show successively any regularity of

to it at the present time owing to the large number of deep holes which are being sunk to prove the existence and position of the ore bodies at increasing distances from the outcrop. For



chemical phase; one may be more acid than the next, or may be capriciously either, thus not possessing the regularity of the Rosenbusch order of crystallization. The writer was enabled to exemplify these propositions at the Steamboat Springs, which are near. This occurrence, as is well known, is often cited as an instance of vein filling now in actual progress, and consequently is one from which many of the ideas in regard to vein filling, including those on the crystallization of vein minerals, were derived. Another very good instance also occurs at Bridgeport, Mono county, Cal., near the source of the East Walker. It appears to have passed so far unnoticed. Instead of quartz being the filling material, a variegated travertine is filling the fissures. It is shown at this place, in addition to what is shown at the Steamboat Springs, how a portion of a vein may be formed without being directly attached to a previous surface. Hence idiomorphism has been taken in the sense just described in the study of the ores.

**AN OCCURRENCE OF NATIVE COPPER.**—One occurrence of native copper has been discovered. It is not extensive enough to have sufficient economic value to make the mining of it profitable, but a study of its origin was found to be of an economic worth. While the ore bodies themselves have been produced by aqueous solutions, this occurrence of native copper was produced by reduction due to the heat generated by subsequent dynamic action, and a close parallelism was thus found to smelting processes, and by chemical and microscopical investigation of the ore and rocks adjacent to the native metal many of the steps that have been taken in the reduction are revealed, with the result that several suggestions were obtained for the actual treatment of the ores, and thus an opportunity was offered for an improvement in the smelting formulas and some troublesome irregularities lessened.

### New Steam Shovel.

The Vulcan Iron Works Co. of Toledo, O., describes a series of equipment in steam shovels designed to embody the essential qualifications of a successful machine. The boom is constructed along the lines of box section construction, entirely of steel angles and

per shaft pinions with cut teeth. The shipper shaft is made with square seats for gear and pinion mounted into adjustable bearings.

The circle is made heavier than heretofore, roller bearings are also established in the "A" frame head, designed to contribute to ease and rapidity with which the shovel may be operated.

Car is made up of six heavy beams, four running full length; steel spreaders or separators are used in the car body for a rigid foundation upon which to build the operating machinery.

The boilers are of the marine return tube type and tested for carrying 150-pound working pressure, equipped with pump and injector water feed, pump feeding through hot water heater. All steam pipes, boiler and machinery, except on boom, is under cover. The house is of structural steel, enclosed with steel roof. The rear guys are double, of flat eye bar construction, adjustable to lower boom to height to pass inside of ordinary railroad dimensions.

These shovels are stated to be self-propelling under ordinary conditions, the propelling gear having a ratio power of 4 to 1, driving from both trucks.

### Gold in Coal.

Considerable attention has been given the past few months by various observers to the occurrence of gold in coal. Jas Chenhall, in a paper read before the Institution of Civil Engineers, describes the Cambria coal fields, situated in Weston county, Wyo., about 65 miles from Deadwood, S. D., and says the attention of geologists will be especially attracted to the fact that this coal carries values in gold. This is sufficiently important to make one wish that the geology of the field had been given. The references to this should be given in the author's own words: "Sulphur and iron are present in some portions of the coal in the form of pyrites. Sometimes as high as 2% of sulphur is found. The pyrites are very unevenly distributed throughout the seam." After references to the quality and uses of the coal, the author adds: "Its only drawback is a high percentage of ash, but compensation is made in the case of smelting the precious metals by the fact of this coal and coke

report in this paper, F. B. Stephens, lecturer on metallurgy at the Otago University, subsequently director of the Stawell School of Mines (Vic.), and manager of the Cassilis G. M. Co., Gippsland, wrote as follows: "The report is correct. In 1895 I happened to be assayer for the Buffelsdoorn Estates & G. M. Co., Klerksdorp (S. A.), when the discovery was made. The ore mined was quartzite, and occasionally showed patches of banket. Running through the quartzite in many places were small seams of coal of the nature of anthracite. Some of this coal assayed as high as 800 ounces of gold per ton. The gold was exceedingly fine, and was not apparent at a casual glance, but on closer examination it could be seen very thickly peppered through the coal. The ash of the coal was colored bright purple from the amount of gold it contained. One small seam that was found lying flat against an intrusive mass of diabase looked like honeycomb, the gold taking the place of the honey. Strange to say, it was only where the quartzite was cut through by the dyke that the coal contained any gold. In other parts of the mine the coal was quite barren. The coal contained iron pyrites, and without doubt the pyrites in contact with the coal deposited the gold from solutions which had found their way up the dyke fissure, the gold most likely being dissolved out of the underlying auriferous strata. I never communicated the discovery to any scientific paper before, but several well-known geologists received samples of the coal."

The occurrence of gold in coal is also reported from Colorado, and it is not improbable that gold may occur in coal more commonly than is generally supposed, particularly in the gold regions where coal is also found.

### Grading Analyses.\*

Written by H. S. DENNY.

In reducing an ore to pass a mesh of 600 holes to the square inch it may be taken as an axiom that we have practically every variation of fineness between that mesh and infinity in the finished product. In other words, it may be stated that the means adopted to arrive at a required product, all of which will pass a 600-mesh, will also ensure the passing of a large percentage of that product through a much finer mesh. Hence arises the necessity for what we are accustomed to term a grading analysis. It is a matter of considerable surprise to me that this question has not been ventilated more freely by the technical societies here long ago, as, in my opinion, there is a demand for uniformity and agreement both as to the meaning of the term and as to the most suitable method for handling the operation. I have frequently known the term "grading analysis" to be made use of, but no definite and generally accepted meaning can be said to have been arrived at in its particular application to ore reduction on these fields. The first thing, therefore, that we must agree upon is the exact interpretation to be placed upon it, and to this end, after careful consideration, I submit the following suggested definition: "A grading analysis is the determination in any finely ground auriferous product of the percentage and value of two or more size-classified divisions of that product."

The objects of the analysis are briefly as follows:

1. To show clearly the percentages of certain arbitrarily fixed degrees of fineness in the ground product.
2. To enable the operator to arrive at the gold value of such percentages.
3. To enable the operator to judge of the relative amenability to his methods of treatments of ore in the various stages of comminution lying between coarse particles and very finely divided particles having particular regard to gold extraction.
4. To enable the operator, by virtue of the above information, to fashion his treatment practice to gain the maximum extraction.
5. To assist the operator to ascertain where his extraction is at fault and where his gold loss in residues lies.

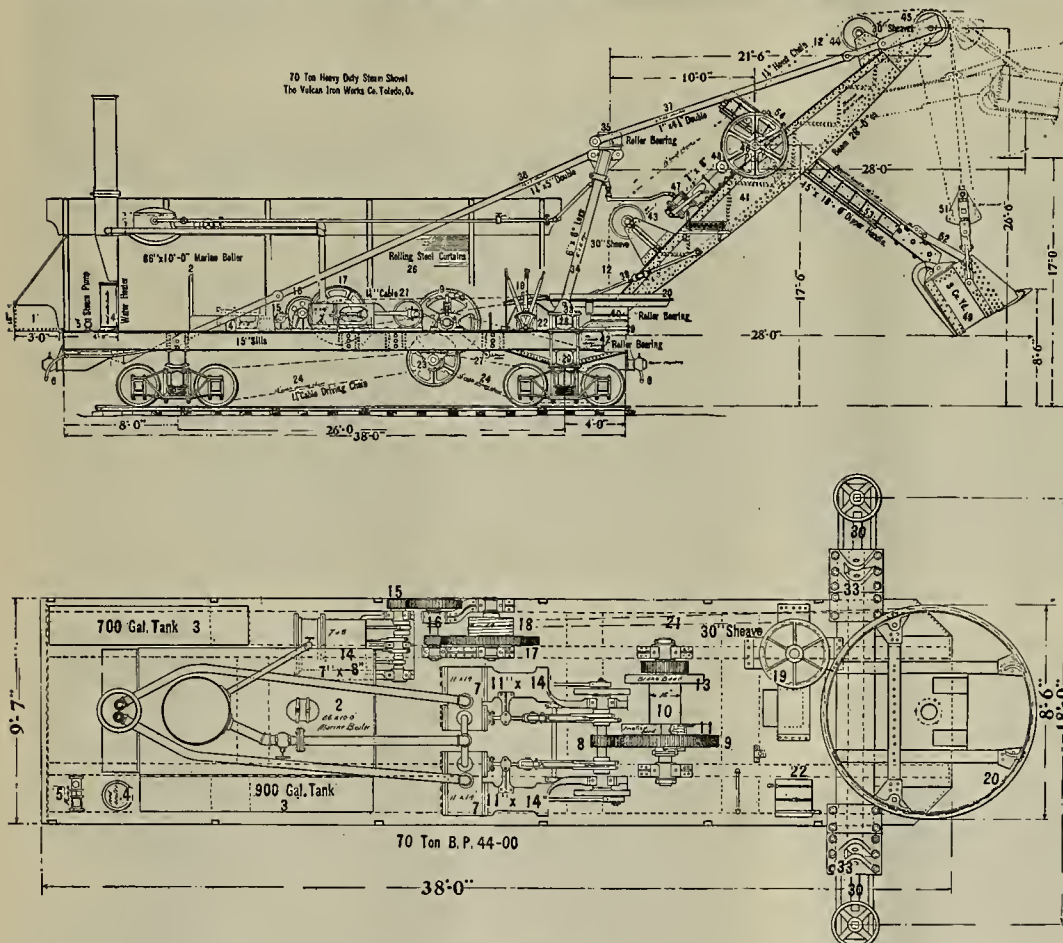
It will be observed in the statements elsewhere given that the classifications adopted in the mines with which the writer is connected are as follows:

Percentage remaining on 60	$60 \times 60 = 3,600$	screening.
Percentage remaining on 100	$100 \times 100 = 10,000$	"
Percentage remaining on 150	$150 \times 150 = 22,500$	"
Percentage remaining on 200	$200 \times 200 = 40,000$	"
Percentage passing 200	$200 \times 200 = 40,000$	"

This series can naturally be altered to give either greater or less detail, but for our particular purposes it fulfils all practical requirements.

**DRY AND WET ANALYSIS.**—Despite all the experiences of the past two years, I am still in doubt as to which particular method of analysis gives the more reliable and consistently average results, and, in order to make my perplexity apparent, I can not do better than lay the brief reports of four mine managers before you, each report representing an emphatic opinion on the question, and each differing from the other. Most of the important considerations in the subject under discussion are touched upon in one or the other of the four reports, and I

\* Abstract Trans. S. A. Assn. Engrs.



plates, braced internally to withstand intermittent strains. It rests in a steel trunnion at the foot, and is supported at point by wrought iron stirrups. These stirrups are connected to the "A" frame head, with double flat eye bars. The dipper handle is of steel I beams, stiffened with channels and bars; the packing of wrought iron with cut teeth, each side in one continuous piece, bolted to flanges of stiffer channels. Three styles of dippers are offered in this construction—round, square or semi-square—according to the class of material to be dug. For convenience in finishing slopes, etc., the dipper is adjustable to any pitch. The mouth piece and wearing plates are of manganese steel, teeth of hammered iron, with tool steel or manganese adjustable points. The dipper handle operates over wrought steel ship-

containing a small quantity of gold and silver. Some samples have given as high as 3 dwts. of gold to the ton of coke, but the average is between 1 dwt. and 2 dwts. of gold to the ton. This is the first time that the author has found gold and silver in the ash of coal. Coke from these mines is almost exclusively used in the gold smelting works at Deadwood, in the Black Hills, S. D."

Another writer says though the presence of gold in coal may be new within Mr. Chenhall's experience, it is by no means a unique occurrence. A few years ago, in the end of 1899, to be precise, a similar discovery was reported from Gippsland. Miss E. Felstead of St. Kilda, found gold in a small piece of household coal. Gold has also been found in South African coal, and when a doubt was cast upon the



do not think that a better basis for a further and more complete investigation could be provided. I shall describe the reports as "A," "B," "C" and "D," and they are as follows:

**REPORT "A."**—Sieving.—The screens, sands residues and sands charges are all graded dry (the slimes only being graded wet), using the following sieving—3600, 10,000, 22,500 and 40,000 mesh per square inch. These four sieves all fit into each other with a cover and tight-fitting bottom compartment, forming a nest of sieves. When grading, the sieves are all superimposed, the weight sample being placed on the top or coarsest sieve, and the nest is well shaken, the cover being occasionally removed and the ore rubbed over with a camel hair brush, each grade being finally finished separately over a sheet of glazed paper; when no more will pass that particular sieve, the contents are emptied out and put aside for weighing, the same routine being repeated until all that is possible is obtained of each grade, the balance having passed through into the bottom of the compartment.

**Sampling.**—Out of all the daily screens, sands-charges and sands-residues samples, 2000 grains are kept, which is put aside until the end of the month, when the whole sample is placed on the sample table, well mixed and quartered down to a convenient size sufficiently large to allow repeating should it be necessary.

**Quantities.**—There are 20,000 grains graded from the screens sample, and 40,000 grains from sands charges, sands residues and slimes samples.

**Slimes.**—In grading slimes samples there are only two products to be considered—viz., sands and slimes. The 40,000 grains of slimes are weighed, and a portion is then put into the 40,000 mesh sieve, a large enameled dish is placed on the bench, and the clean water tap is connected with a short piece of India rubber tubing, the other end of which is used for playing a gentle stream of water on the sample so as to wash all the slimes through the sieve. The water hangs back in the sieve, owing to the fineness of the mesh, but by frequently rubbing over the slimes and water with a large camel hair brush the slimes are all gradually washed through, and only clean sands remain on the sieve. These sands are dried and weighed and the percentage of slimes obtained by difference.

**Wet and Dry Methods.**—From our experience in comparing wet and dry grading analyses, it is very noticeable that when using a nest of sieves constantly for wet work, the screening stretches very considerably, and therefrom a great irregularity arises in the results obtained, as proved by the differences in running two lots of the same original sample through. On the other hand, when grading dry and using a tight-fitting cover and nest of sieves with a minimum of dusting, concordant results can be obtained over and over again.

**REPORT "B."**—The method adopted on this property is the wet one. The japanned sieves are arranged in their correct order, and the sands are gradually fed into the top sieve and washed through as far as possible. When this sieve is cleared of all slimes—this point is denoted by the clearness of the water—it is removed, and the remaining sieves in order treated in the same manner. After the various products have been thoroughly dried they are returned to their original sieves and shaken for a few minutes, to insure that none of product 2 has remained with 1 or 3 with 2.

The amount of ore taken is 1000 grammes, equal to about 2 pounds avoirdupois. This quantity is chosen to simplify the working out of percentages.

**Wet and Dry Methods.**—Although the wet method takes a longer time, it has the advantage that the point when the finest product—i. e., that which passes the 40,000—has been eliminated, is more clearly defined. There is also to me some doubt as to whether in the dry method the original condition of the ore under examination may not be altered by attrition.

**REPORT "C."**—I have tried both wet and dry methods of grading, and have lately adhered solely to the former, it being in my opinion better for the following reasons: (1) Entire absence of loss from dusting, which is always more or less in evidence in the dry method. (2) Much less time is occupied, as the operation can be pushed without fear of loss. (3) The results of the wet method show much less variation, and, I consider, are more reliable than dry. The one objection I have to the wet process is that it necessitates settling slimes, decanting water, and subsequently drying of the product. As regards the wear of screens, I do not find much difference in this respect between the two methods.

**REPORT "D."**—Locally-made sieves are used—18 inches diameter and 3 inches deep—with the screening specially supplied; 1500 grammes are taken of the sample and first treated on the 200 mesh. The reason for separating the finest portion first is that the presence of the coarse particles keeps the mass more open, avoids the clogging of the fine mesh, and thus facilitates the passage of product through same; the amount of fine product is also at once eliminated. The actual separation is then made by gently shaking the sieve laterally, varied with the circular motion as in panning, and constant tapping on the frame of sieve. The latter method appears to me most

effective, especially when nearing the end. The separation is considered complete when by placing a clean sheet of paper under the sieve and continuing the shaking, etc., for a few minutes longer, an unweighable quantity only is obtained. During the operation no brush or other means are used to assist the material through the mesh. The residue is then transferred to the coarsest (60 mesh) sieve, the operation as before repeated, and subsequently continued with the 100 mesh and 150 mesh, respectively. In the earliest stage of grading practice a nest of sieves was procured, the diameter being 9 inches and the depth 2 inches, but the sieving was found to be very tedious and very slow, and in order to deal expeditiously with the comparatively large amount of samples that was required in order to get sufficient of each product to determine its gold value, water was used both with a jet and by partly immersing in the water the sieve and contents, and agitating, etc. This method answers admirably for the quick separation of the fine or slimy portion, but it was not at all satisfactory in separating the coarse particles; the difficulty lay in getting a satisfactory ending to the small particles persistently, and in small quantities going through. This could not be obtained by the gentle impinging of a jet or by the continuous and prolonged shaking and mixing with or without spatula or brush, or by any other manner that could be devised. An average of four separate analyses by the wet method gave a 20% higher result for the product that remained on the 60 mesh than a similar number by the dry. The cause, I believe, is that the particles of the 100-mesh (and finer) product have not sufficient weight in themselves to at once settle in disturbed water, and find their way through the mesh—this point may be clear if the suspensory

quickly or of enlarging its meshes, how often should a screen be used, and what check can be applied to determine its condition?

8. Is the possibility of loss from dusting a serious drawback to the dry method?

9. Is the possibility of attrition more accentuated in the dry than in the wet method?

**WET METHOD.**—1 to 5. Same as under dry method.

6. Is the screen worn more rapidly by the wet than by the dry method?

7. Same as under dry method.

8. In sands and slimes residues, is the point raised in Report "D," re gold in solution being washed away, important enough to condemn the method?

The above points represent in brief the problems under either method, and it may be that there are members of this society who have engaged these problems in the past, and their experience would be useful in finally deciding on the correct procedure. In the meantime I am of opinion that the results from either method employed should be checked as often as possible by the other method. There is no doubt that all the points above raised can be settled by careful experimenting, and it seems to me that the value of the work is such that experiments should be conducted regularly on every mine on the fields. I might add that if I had to choose one of the two methods above, my inclinations would be in the direction of the dry method.

**RECENT ANALYSES AT VAN RYN.**—The following statement represents the grading analyses of samples carefully taken over periods of several months at the Van Ryn mine. I have thought it better to give this statement in full and over several months, so that comparisons can be made as between month and month:

VAN RYN GOLD MINES ESTATES LIMITED.											
Screening.	Aug., 1904.	Sept., 1904.	Oct., 1904.	Nov., 1904.	Dec., 1904.	Gold per ton.	Gold per ton.	Gold per ton.	Gold per ton.	Gold per ton.	Gold per ton.
	Percent.	Percent.	Percent.	Percent.	Percent.	dwts.	dwts.	dwts.	dwts.	dwts.	dwts.
Screen samples.....	27.45	3.6	29.15	3.7	28.60	3.80	28.81	4.3	27.84	4.9	
Screen samples.....	21.42	10.2	20.37	9.3	20.39	0.50	20.70	5.4	21.26	9.8	
Screen samples.....	9.70	18.10	8.58	18.3	9.45	17.80	7.45	14.5	7.16	17.1	
Screen sample.....	4.60	30.80	4.63	16.5	5.81	20.9	5.09	17.0	5.81	21.8	
Screen samples.....	36.85	11.10	37.37	10.7	35.69	10.69	37.95	8.7	37.93	10.7	
Cyanide charges.....	35.29	3.8	41.35	3.6	35.45	3.85	39.49	3.7	36.70	4.3	
Cyanide charges.....	32.0	3.3	31.05	4.2	31.68	4.0	31.04	3.8	31.74	3.8	
Cyanide charges.....	10.67	3.6	10.80	4.1	10.25	3.70	11.1	3.6	10.92	3.7	
Cyanide charges.....	5.35	2.6	5.57	3.8	6.47	3.70	6.01	3.1	6.32	3.2	
Cyanide charges.....	13.69	5.6	11.23	5.0	16.12	5.20	12.36	4.7	14.32	5.3	
Cyanide residues.....	38.82	1.1	40.0	1.25	39.32	1.32	40.15	1.27	39.15	1.4	
Cyanide residues.....	30.51	0.70	30.84	0.75	31.63	0.75	30.96	0.70	32.31	0.7	
Cyanide residues.....	11.55	0.35	10.76	0.30	10.51	0.15	10.96	0.50	10.27	0.42	
Cyanide residues.....	4.58	0.27	5.47	0.40	5.77	0.20	6.68	0.35	5.56	0.15	
Cyanide residues.....	14.34	0.70	12.93	0.50	12.77	0.45	11.25	0.50	12.71	0.5	
Slimes originals.....	5.27	2.3	6.45	2.0	5.94	1.8	4.26	1.5	3.61	1.2	
Slimes originals.....	94.73	2.1	93.55	2.1	94.06	2.1	95.74	1.9	96.39	1.9	

effect on slimes is considered—and, furthermore, the wetness itself causes adherence of the particles.

It might be thought that a jet of water must necessarily carry through the mesh any particles sufficiently small, but mention must be made that only a weak jet can be employed, otherwise loss of sample by splashing would occur, and any pressure that would expand the mesh is to be avoided. The impracticability of using the wet method with sands and slimes cyanide residues is demonstrated by the soluble gold being carried away in the wash water.

It may be assumed that all the particles of silica upon their exit from the mortar box are in a more or less fractured condition, and therefore all shaking, etc., in the subsequent sieving operations—in addition to self-attrition—must increase the fineness. The use of a brush or other means to assist the passage through the sieve has the effect of expanding the mesh, especially the very fine hair-like wires of the smaller sizes. A similar danger may result by the weight of a large sample pressing on the mesh of a large area sieve. After a sieve has been in use a few times the threads become worn and stretched.

A study of these reports will show that there is considerable diversity of opinion as to the relative merits of the "wet" and "dry" methods. "A" recommends the dry method for screen, sands charges and sands residue samples, and the wet method for slimes. "B" for all samples uses the wet method first, but as a final test applies the dry method. "C" is emphatic on the superiority of the wet method. "D" is just as emphatic on the superiority of the dry method, and has entirely discarded the wet method. The queries that arise on the respective methods are interesting, and on their settlement will depend the final method to be adopted. They are briefly as follows:

**DRY METHOD.**—1. Of what material should the screen be made?

2. What should be its dimensions?

3. What weight of sample should be taken?

4. Should the sample be treated first on the 200-mesh screen? (vide Report "D").

5. Should a brush or other instrument be used to agitate the sample on the screen? (vide Report "A"). Or should a gentle shaking or tapping on the screen be adopted? (vide Report "D").

6. By placing the glazed paper under the screen can we arrive at a satisfactory determination of the completion of the operation?

7. In view of the danger of wearing the screen

Taking the Van Ryn statement, we find in the screen sample that:

The percentage remaining on 60 mesh varied from..... 27.45 to 29.15  
The percentage remaining on 100 mesh varied from..... 20.37 to 21.42  
The percentage remaining on 150 mesh varied from..... 7.16 to 9.7  
The percentage remaining on 200 mesh varied from..... 4.6 to 5.81  
The percentage passing 200 mesh varied from..... 35.69 to 37.95

(TO BE CONTINUED.)

## The Simplon Tunnel.

The piercing of the Simplon tunnel a few days since, says Page's Weekly, is the culmination of one of the most striking engineering feats of the present day; it is a remarkable instance of the triumph of mind over matter. The long anticipated juncture of the north and south sections of tunnel appears to have admirably fulfilled the calculations of the engineers. Napoleon's road over the Simplon was commenced in 1800 and finished in 1806. It still offers the route for those who are in search of scenery and whose time is unlimited. The new tunnel pierces the Alps at a lower elevation than any other route, viz., at 2300 feet above sea level.

With the exception of a short curve at each extremity, the route follows a straight line. It is a double tunnel with two parallel sections, 55 feet from center to center, each designed to carry a single line of rails. As yet only one of these has been constructed completely. The other, consisting at present of a gallery some 6½ feet high by 10 feet wide, is used for ventilation and purposes of construction. According to the international agreement between the two countries, it need not be completed as a second tunnel until the gross receipts from traffic between the tunnel termini exceed £3218 per mile per annum.

The exact length of the Simplon tunnel is 19,731 kilometers (12½ miles); it is, therefore, by several miles the longest tunnel in the world. The mountain towers above it over 5000 feet on the average, and 7000 feet at the highest point. Cross-headings connect the two tunnels at intervals of 656 feet. The extreme height of the tunnel is 18 feet above rail level, its width varying from 14 feet 9 inches at the latter point to 16 feet 4 inches at a height of 6 feet 6 inches above rails. The center of the tunnel is for a distance of 1310 feet of wider section, in order to admit of trains passing. From this mid-distance there is a gradual slope to both termini—that on the north side having a ruling gradient of 2 per 1000, while



that on the south side has a ruling gradient of 7 per 1000. The contract price for the tunnel is over £2,350,000; but, of course, the actual cost is as yet an unknown quantity.

The execution of this remarkable work has called for admiration all along the line, whether one considers the mechanical perfection to which the contractors brought their machinery or the organization of the 3000 men employed, who appear to have worked with an undivided enthusiasm and an almost military precision. It says something for the brains employed upon the scheme that, in spite of the most trying conditions, an excellent standard of health has been maintained among the workers, the most careful arrangements having been made to protect them

litre of water per second. The two cylinders are connected by cross waterways and the piston of one acts as the valve of the other. The speed of the cutter necessarily varies for different densities of rock, but its highest speed is ten revolutions per minute. The drill, as described, is mounted in groups of two or more on a heavy iron thrust bar, about 12 inches in diameter. The figures are from the Engineering News.

In the process of excavation followed it has been usual to make an advance heading, 7 feet 10 inches

was stopped by hot springs.

An engineer connected with the work deals in the Times with some of the difficulties encountered: The gradient ascends from each entrance towards the middle of the Alps for drainage purposes, and it is due to this that it has been possible to carry on the work, as the yield of the great springs flows away by gravitation. At 4400 meters from the Italian entrance a very large spring of cold water of 12,500 gallons per minute—in fact, a river—was struck, and this caused several months of delay at this end of the

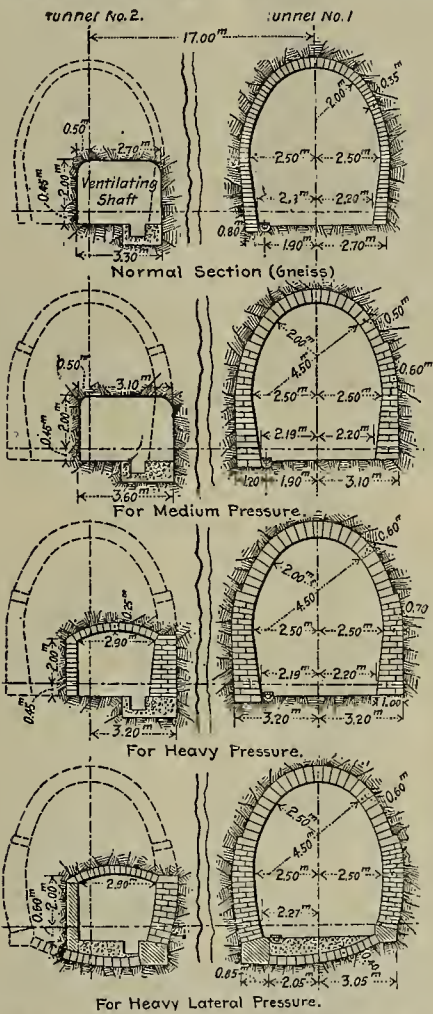


Fig. 1—Standard Sections of Simplon Tunnel.

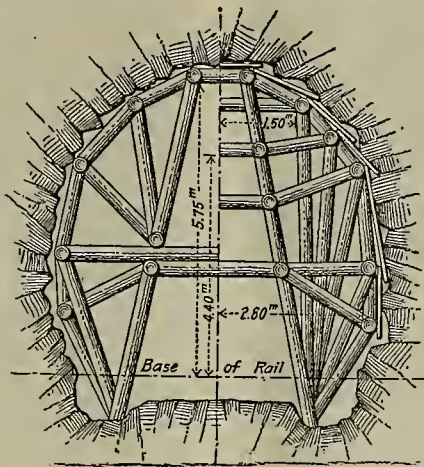


Fig. 2—Standard Form of Timbering for Simplon Tunnel.

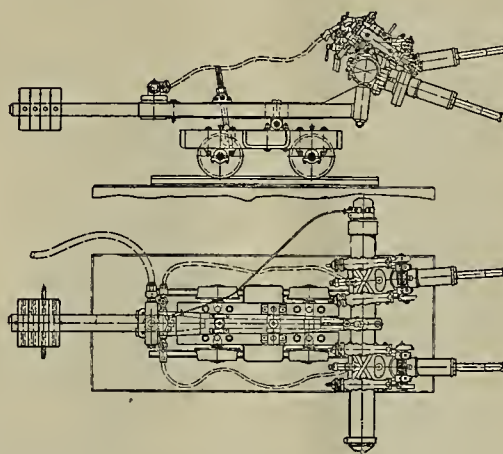


Fig. 4—Elevation and Plan of Drill Used in the Tunnel.

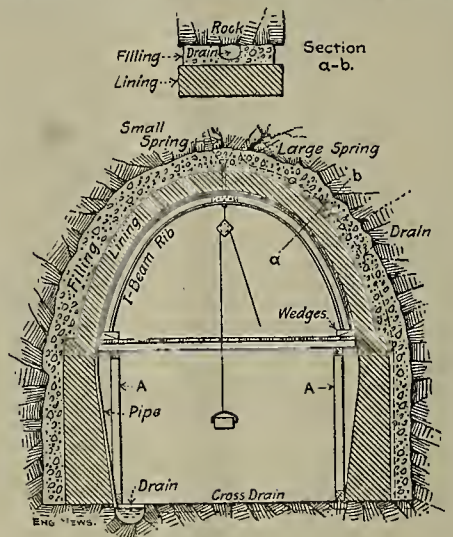


Fig. 5—Diagram Showing Method of Constructing Lining.

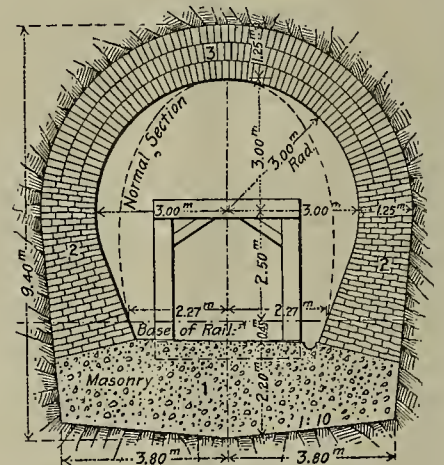
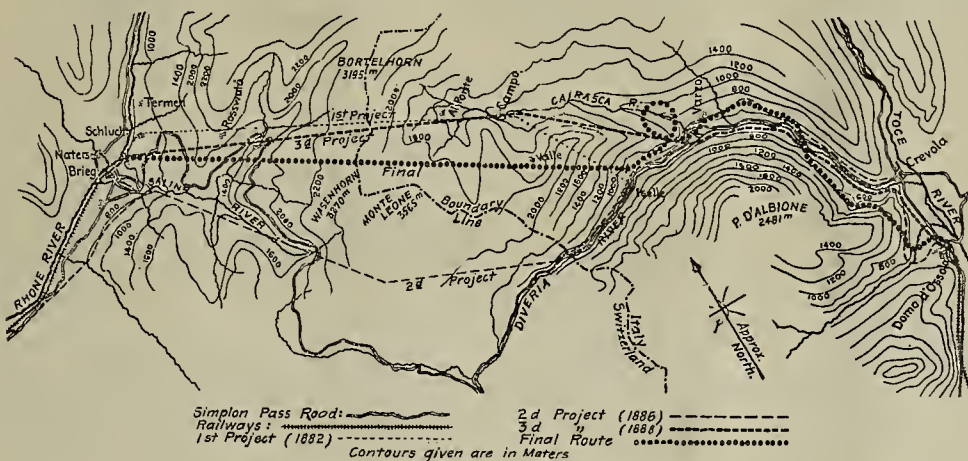


Fig. 6—Lining Used for Heavy Pressures.



Map Showing Proposed Routes of Simplon Tunnel.

from the dangers attaching to sudden changes of temperature and wet clothes. Most careful attention has also been given to vital questions of ventilation and commissariat.

An important factor in the rapid execution of the work has been the drill shown in Fig. 4. The feed of the rotary cutting tool is accomplished by the direct pressure of water in a large cylinder, the piston of which returns automatically when the water supply is cut off. The mandril carrying the boring bar and also the cutter are driven by means of two cylinders located above the feed cylinder. These cylinders operate a shaft having a worm gear which meshes with a worm wheel centered on the mandril. The cylinders are 1½ inch in diameter and their pistons have a stroke of 2½ inches. They are operated by hydraulic pressure, and each uses normally one

by 10 feet 8 inches, by means of the power drills. This has been timbered and covered in for the passage of compressed air locomotives and trucks. From this a shaft was driven to the roof line every 164 feet, and from these the tunnel has been opened out both ways to the complete section. Dynamite and blasting gelatine have been the explosives used at the Italian and Swiss ends respectively, and, as a rule, eight blast holes were drilled at the face, the machinery and men being withdrawn for refuge to the cross galleries or service tunnel. In 1898, 1342 feet were bored, each of the successive years up to and including 1903 being responsible for over 11,000 feet; while in 1904, 5457 feet were excavated, and during the present year 557 feet have been taken out. The work, of course, proceeded simultaneously from both ends, but in May last driving at the Brigue end

tunnel. The ground was very treacherous, so that it had to be heavily timbered; the stoutest and largest timbers were crushed, and steel girders had to take their place; but so great was the weight that these were twisted and distorted, and finally were only held in their place by being strengthened with concrete in cement. This enabled the driving of the gallery to proceed, but meanwhile the Brigue end had reached the top end of the gradient in the middle of the tunnel, although the rock temperature had risen to 132° F., fully 25° more than had been expected. With a view to saving time, it was then decided to continue this and drive down the Italian gradient to meet the corresponding tunnel coming up from Iselle, although it was quite anticipated that difficulties would be met with in driving down hill. In this the contractors were not deceived, for very soon hot springs of 111° F., and of considerable volume, were met with. These springs are far hotter than is bearable, but the engineers adopted the comparatively simple expedient of throwing jets of cold water into the fissures and thus reducing the temperature as far as was necessary. The cold water is driven into the tunnel by centrifugal pumps, through pipes surrounded by non-conducting material, so that the water is delivered as cool as possible.

Meanwhile the work at the Italian face was pushed on, until in September last another hot spring of 114° F. was encountered in each of the parallel galleries, amounting to about 1800 gallons per minute, and considerable difficulty and great delay were caused. By dint of extraordinary perseverance and courage, these springs were passed and soon left behind by the drill. The volume of water then emitted from the tunnel was still about 12,000 gallons per minute. When the actual junction of the galleries was effected the accumulated hot water on the Swiss side found its escape into the south gallery, and was discharged into Italy.

The work that now remains to be done is to put in place the masonry arching, to cover over the water channel beneath the floor of the tunnel, and to lay the permanent way.



### Mining Enterprise in Colorado.

Written for the MINING AND SCIENTIFIC PRESS.

Clear Creek, Colorado, is one of the leading mining counties of that State. It was in this county that gold was first discovered in Colorado, in 1859. The principal veins found during the early history of the county were gold bearing. Near Georgetown a number of veins first worked for gold were later found to be rich in silver also. The several important towns sprang rapidly into an energetic and well-founded existence. Among them were Georgetown, Idaho Springs, Empire and Lawson. Thousands of miners hurried into the district and the mines were developed rapidly. The placers yielded famously, both gold and silver, and strangely less attention was paid to gold than to silver in those early days. Among the most noted mines of the early days were the Pelican-Dives, Seven-Thirty, Colorado Central and Empire, near Georgetown; the Red Elephant, near Empire and Lawson, and the Fremont, Lamar

Nails, per keg	20 00
Coal oil, per gallon	5 00
Miner's wages, per day	4 00
Team and driver	12 00
Milling charges, per ton	5 00
Smelting charges, per ton	60 00
Freight, per ton	25 00

The prices on some of the items to-day is but about 20% of those given above.

During the two years following the discoveries on McClellan mountain miners rushed into Clear Creek county from every direction and rich mines were discovered on the mountains all about Georgetown. In 1867 several smelters were erected, but none of them were very successful in reducing the ore from these mines at that time. Some of the ore found on McClellan mountain, which, it is said, showed no trace of silver minerals when examined with a magnifying glass, still assayed upward of 100 ounces silver per ton. The silver was so closely associated with the galena and blende that it could not be seen.

The accompanying illustration is that of McClellan mountain, showing the dumps of the Colorado Central mine.

The development of the early days not only furnished a large amount of ore, which proved highly remuner-

mountains for thousands of feet, crosscutting the country and developing the numerous gold and silver veins at great depth.

The Stevens mine, owned by the Waldorf M. & M. Co., was one of the first noted mines in Colorado. The Waldorf Company is one of those which has undertaken the consolidation of large interests on McClellan mountain, and the driving of a great tunnel to develop the veins in depth. As announced in these pages last week, the Waldorf tunnel is now in 3800 feet, and is reported to have cut forty-four veins, at least thirty of which contain a grade and amount of ore which will pay for shipment. The tunnel is cutting veins at depths ranging from 500 to 1500 feet lower than the deepest old workings made from the surface. When completed the Waldorf tunnel will be over 9000 feet in length. Its line intersects ninety-five known veins, nearly half of which have already been intersected by the tunnel.

Another prominent mining enterprise, similar in object and result to that of the Waldorf Company, is the Vidler tunnel, which starts on the east side of the divide in Clear Creek county and, running 7000 feet, will open on the west slope in Summit county.



McClellan Mountain, Clear Creek, Colo.

time and Stanley mines, near Idaho Springs. It is said that during this period "fighting men" were paid \$10 per hour to watch the location stakes and monuments until the claim could be properly staked and the location placed on record in the Land Office. Georgetown was a very prosperous town at that time, and the surface workings of the mines netted their owners hundreds of thousands of dollars. The first prospecting for silver was done in 1864 when Huff, Layton and Steele discovered the Belmont Lode, on McClellan mountain. The surface ores gave high returns in silver and shipments commenced from the croppings. In those days silver was a good price, but smelter charges were four or five times higher than now. Freight also was much higher, as well as the cost of tools and all kinds of supplies, and labor was better paid then than at present.

A comparison of the following figures—prices as late as 1870—with those obtaining in that district to-day is interesting:

Steel, per pound	\$ 0 40
Iron, per pound	25
Rope, per pound	60
Nitro powder, per pound	1 00
Detonators, per hundred	3 00
Fuse, per 1000 feet	30 00
Lumber, per 1000 feet (B. M.)	60 00
Candles, per box	20 00

ative to the owners, but it also left available large amounts of ore too low grade to be profitably extracted and treated at that time, but which is available to-day.

The railroads were the main factor in the development of new conditions. Supplies were obtained more readily and at greatly reduced cost. The era of excitement passed away and mining settled down to a more conservative and business-like basis. The depreciation of silver was for a time an almost fatal blow to the progress of the mining industry about Clear Creek county, but, fortunately, as silver went down in price, lead and zinc went up, and as the great leads of these mountains carry vast amounts of both lead and zinc, it has enabled the miners of that section to not only prosecute their business, but to make large profits from it as well.

The discovery and rapid development of such camps as Leadville, Cripple Creek and Creede drew heavily on the best mining talent of Clear Creek county, and many of its most energetic and experienced men left to try fortune in the newer camps, but others—equally energetic, experienced and resourceful—remained. Some of the greatest mining schemes in the State of Colorado are slowly developing in this county. These are the tunneling of the

Good progress has been made in this tunnel, which is 10x10 for 250 feet and then reduced to 8x8 for the remainder of the distance.

What is known as the Kelley tunnel is being driven under Democrat mountain to develop a large group of mines. It will cut some of the veins 3000 feet below their apex.

The Newhouse tunnel is in under Seaton mountain, nearly 3 miles, and will eventually tap the veins of the district about Central City.

In addition to these, there are numerous other tunnel projects of greater or less magnitude, in operation or projected. It is said officially by the State Commissioner of Mines of Colorado that the number of crosscut tunnels in Clear Creek county is greater than in any other section of the State. The mountains rise abruptly, and quickly give good working depth to the tunnels, and the veins apexing on the surface having been found almost uniformly to persist in depth proves that this method of exploration and working is justified, as shown by the results.

The geology of the Clear Creek region is thus described by the State Mine Commissioner:

"The geological formation is that common to the front range of mountains, viz., granite, gneiss and schist, and is traversed by a series of eruptive dikes.



The mineral bearing veins are of the fissure type, and the precious metal deposits were, in the main, subsequent to the dikes. Not infrequently the vein is in direct connection with the dike which forms one of the vein walls, or may locally constitute the vein material itself. The dikes are of frequent occurrence, of variable size and character lithologically, but are all generally called porphyry. The mineral bearing veins are, in the main, roughly parallel to, when not in conjunction with, the dikes. While the dikes and veins show variable strike, the most persistent and common course appears to be from north-east to nearly east, with a northerly dip. The north and northwest veins are less prominent and generally not so persistent in mineralization. The ore veins vary in width from a few inches to zones or vein systems of 100 feet or more. Generally, the vein walls are well defined, quite hard, and separated from the vein proper by a thin selvage or 'gouge' material. Locally, however, the 'pay ore' or 'mill dirt' may impregnate the adjoining country for some little distance.

"The vein filling is generally an altered condition of the country rock, more or less impregnated with variable sulphides. The main values, however, occur in form of ore shoots concentrated near one wall. The shoots are more or less persistent longitudinally, in many places showing the ribbon structure, and vary from a narrow streak to a foot or more. The associated low-grade ore bodies are generally larger. This common condition has caused the parlance of the district to designate the two ore bodies as 'pay or smelting ore' and 'mill dirt or mill ore.' The ores are mainly sulphides of iron, copper, lead and zinc, with associated gold and silver values. Under former market conditions, the mines adjacent to Georgetown were worked for silver output, and established an erroneous belief that gold existed only in minute quantities in the western part of the county. The changed conditions have caused a search for gold bearing ores, and the imaginary line that divided the gold bearing and silver bearing areas has been obliterated.

"The most common method of mining is to break the mill dirt, leaving the smelting ore to be taken down separately. This latter is assorted, the refuse put with mill dirt and the choice ore shipped direct to the smelter. Some shipments of assorted ore are very high in gold and silver values. As a rule, the ores are amenable to the ordinary methods of amalgamation and concentration, and mills of this character are found in all sections."

### How to Use Portland Cement.

Care at all times should be taken in mixing concrete to use only clean, sharp sand (free from loam or soil) with pebbly grit, old broken bricks, stones or slag. Portland cement, either in casks or bags, must always be kept perfectly dry till used, damp being very injurious, causing it to become lumpy and useless. Brickwork and bricks or stones should always be well wetted or soaked in water before using.

When cement plaster is used for facing brickwork the joints should be deeply cut out and well sluiced and wetted with water, after which it may be plastered, taking care to always keep the edges wet and face damp till finished, and to prevent its drying too quickly. Good results will be found from damping the surface again with a whitewash brush and water, as drying slowly makes better work with more certain results.

Strong Portland cement is heavy, weighing 90 pounds to the cubic foot. Weak cement is lighter, but weight is an unsafe test for cement.

Strong Portland cement is of a blue-gray color and sets slowly. Weak cement sets quickly, has too much clay in it, and is of a brownish color.

The cleaner and sharper the sand, and the less water used in mixing the cement, the stronger it will be.

	1 in.	THICKNESS	3/4 in.	1/2 in.
1 bbl. cement will cover.....	36 feet	48 feet	72 feet	72 feet
1 bbl. cement and 1 bbl. sand will cover..	72 feet	96 feet	144 feet	144 feet
1 bbl. cement and 2 bbls. sand will cover..	108 feet	144 feet	216 feet	216 feet

**CONCRETE.**—One barrel Portland cement, two barrels clean, sharp sand, five barrels broken stone or hard burnt bricks or clean gravel or shingle will yield about 20 cubic feet.

**FOOT ROADS.**—One barrel Portland cement, one barrel clean, sharp sand, three barrels finely crushed firebricks or hard common bricks laid 2 inches thick on a firm foundation of 4 or 6 inches thick of broken stone, well rammed and ground-drained well.

**COATING IRON SHIPS.**—Equal parts Portland cement and clean, sharp sand or finely ground bricks, and laid about 1 inch thick.

It having been frequently found that samples of Portland cement taken from the same bulk have exhibited varying results as to strength and color (the cause thereof being the different methods of mixing employed), the following suggestions will be found valuable to consumers:

1. The cement should be perfectly cool when used. If heated it will become outwardly scorched, and consequently be of a bad color.

2. Cold and clean water should be used in mixing

cement to the consistency of common mortar, as hot water will injure the strength and color. Too much water will make it soft and useless.

3. Care should be taken that the sand used with the cement is of good quality—sharp, clean and well washed from all earthy substance—or the best cement will show inferior results.

4. The cement should be used as quickly as possible after it is mixed. The practice of partially mixing and afterwards remixing is most objectionable, as it destroys its setting properties. It should be allowed to dry naturally, artificial heat being highly injurious to cement.

5. The work should be first well wetted, and when the cement has commenced to set the process should not be disturbed, as if so it cannot be renewed.

6. For stuccoing, the walls should be well cleaned and wetted, and the first coat ought to contain three to four parts sharp river sand to one of cement. When hardened for the second coat, two or three parts of finer sand should be used to one part of cement.

7. For mouldings, use equal parts of cement and fine, sharp river sand.

8. For flooring granaries and maltings, level and well ram the floor, fill up to the required thickness with one part of cement to three or four parts of shingle or broken bricks, and finish off with a float. If the surface is required smooth, it should be overlaid by a thin covering of equal parts of cement and fine sand. When the cement has set, it will benefit by covering the floor with water for several days.

9. For reservoirs, gas or water tanks, use one part of cement and two or three parts of sharp, washed sand for the brickwork, and coat the inside with pure cement.

10. For breakwaters and harbor works, blocks may be formed in moulds to any size required (at the harbor works, Dublin, they are made 350 tons each) by mixing six parts of coarse but clean gravel with one part of cement, into which may be inserted about one-fourth rubble stone. Blocks thus made must be allowed to become thoroughly set before they are disturbed. They will then resist the action of the sea, and become harder and stronger with age.

11. As to storage, great care should be taken in selecting a place for the storage of the cement. If exposed to damp or heat, all cements will rapidly deteriorate in quality. Where a perfectly dry place is available, it will be found advantageous to empty the cement out of the sacks or barrels, allowing it to remain on the floor for a time, exposed to the dry air before using it.

The longer it is setting the more its strength increases.

Neat cement is stronger than any admixture of it with sand.

Cement mixed with equal quantity of sand in a year has approximately three-fourths the strength of neat; mixed with two parts of sand, one-half the strength of neat; mixed with three parts of sand, one-third the strength of neat; mixed with four parts of sand, one-fourth the strength of neat; mixed with five parts of sand, one-sixth the strength of neat.

The cleaner and sharper the sand the greater the strength.

Very strong Portland cement is heavy, of a blue-gray color, and sets slowly. Quick-setting cement has generally too large a proportion of clay in its composition, is brownish in color, and turns out weak if not useless.

The stiffer the cement is gauged—that is, the less the amount of water used in working it up—the better.

It is of the greatest importance that the bricks or stones with which Portland cement is used should be thoroughly soaked with water. If under water, in a quiescent state, the cement will be stronger than out of water. Cement kept in water is one-third stronger than that kept out.

Blocks if kept in water should be stronger.

Salt water is as good for mixing cement as fresh.

Whenever used under water, care must be taken that the water is still, as otherwise a current, whether natural or caused by pumping, will carry away the cement and leave only clean ballast.

**CONCRETE.**—Much harm is done, time wasted, and annoyance caused by the habit of inexperienced persons picking and poking cement samples of work before it has had time to get strength. To such persons quick-setting, light-weight cements would appear to promise good results, but it is now well known by every one practically acquainted with the use of cement that the well-burned, heavy, finely-ground, slow-setting cements are the best for concrete purposes.

The water used for mixing concrete should be clean. It is possible to destroy much of the strength of cement by using dirty or polluted water. Sea water has not been found to be injurious, but it is supposed to delay the setting. Respecting the quantity of water to be used, there is more danger to be apprehended from using less than from using more than the right quantity. The correct quantity is, of course, sufficient to convert the cement into a thin paste, that shall completely coat and cause to adhere all the particles of the aggregate.

Concrete mixed by hand is preferable, as it is important to have the materials all mixed dry before

mixing with water. Crystallization, or setting, begins at once with the addition of the water, and as little time as possible should be spent in thoroughly mixing and placing into the mould or apparatus after water has been added. There are many various concrete mixing machines, most of them being unnecessarily complicated, the best being a plain revolving cylinder, working horizontally. Concrete mixed in machines is generally over-mixed after the addition of water.

The only liability to defects in cementing on concrete walls or floors is where two coats are used, and when idle and ignorant workmen, to save themselves trouble, use too large a proportion of cement for the thin finishing coat. Then, in consequence of the variation in the contraction of the two coats, the outer one is liable to show fine surface—or, as they are often called, sun—cracks, and even in some cases to peel off. Of course, this liability, being known, can be easily provided against.

### Hints to Aid the Identification of Stream Tin.

Written for the MINING AND SCIENTIFIC PRESS by  
CHAS. H. WALKER.

Although the ore known as cassiterite is the mineral from which metallic tin is principally produced, a comparatively small proportion of this mineral is mined from veins and ledges, most of it being extracted from the drifts and gravels of rivers and creeks, where it occurs in the form known as "stream tin." In stream tin we have a mineral which, owing to its mode of occurrence and its weight, can be easily and economically won by the simple method of "ground" or "box sluicing." Under normal conditions the primitive outfit of the placer gold miner, subject to some trifling alterations in the size and shape of flumes and boxes, is absolutely all that is required in order to recover this ore as a concentrate containing about 75% of metallic tin.

To the inexperienced eye the appearance of stream tin ore would not suggest that its metallic contents were worth approximately \$600 per ton. The ores of gold, silver, copper and lead often have a metallic luster, which even to the uninitiated hints of the wealth they may contain. Not so, however, with cassiterite. It is a common, unattractive mineral, showing little outward indication of its intrinsic value. The world's tin supply comes from comparatively restricted areas in widely separated parts of the earth, and it appears somewhat strange that in a continent of this size, which must contain large areas in which the geological formation is favorable for its occurrence, hitherto this mineral has not been discovered in any large or payable quantity. Wherever payable tin has been discovered the production has been usually of a permanent nature—a source of great natural wealth—and its mining has given remunerative employment to many thousands of men. Over two thousand years ago the mines of the Cassiterides (Sicily Islands) were producing this mineral, and many of the nearby mines of Cornwall remain on the "shipping list" at the present day. It is reasonable to suppose that there are many areas upon the North American continent where tin may, and probably does, exist in payable quantities. Let us take it that in many localities tin ore has been discovered, but that owing to its "unlikely" appearance it has not been identified as being a mineral of value. The fact that so little tin mining has been done upon this continent makes it apparent that comparatively few prospectors would be likely to recognize this mineral even should they come in contact with it. If these suggestions are worth anything, then we may take them as fairly good reasons why the discovery of tin ore has not been more frequent. To the unskilled eye the finer varieties of stream tin and "black sand" would appear very much alike, and frequently both minerals are associated in the same gravels. It is the purpose of this article to present to the reader a few of the simpler tests which may be applied to assist in the determination of cassiterite.

Let us suppose the prospector in the act of panning off a dish of gravel. He has thrown out the larger pebbles, and the material remaining in the pan is clean, washed gravel. Perhaps as his washing continues, and he rids the pan of the bulk of the lighter sand, he may find in the diminishing residue a number of "pretty stones," crystals of different colors and of varying degrees of transparency. These may be crystals of topaz, garnet, zircon, tourmaline, sapphire, etc., and if the prospector has any skill in applying the "hardness test," he will be able to identify these crystals fairly well by this means. If he is a judge of their other properties, so much the better; he can then make confirmatory tests. The sapphire will scratch a topaz and they will both scratch a quartz crystal, the sapphire quite easily, and the topaz less so. The other crystals will also scratch quartz if a sharp edge or point is used with a fairly heavy pressure. The presence in the pan of all or any of the above crystals are good indications of the possible presence of stream tin. As the panning off continues, black sands will perhaps



begin to appear. These black sands may consist of magnetite, ilmenite, wolframite, tourmaline or of stream tin alone, or associated with any or all of these minerals, some of them perhaps in the state of fine sand and some in pieces large enough to be easily picked out with the fingers. When the operator has reduced the material in his pan to a good concentrate clear of the lighter sand, the pan should be held over a fire and the contents dried. Then if a magnet will not attract any of the pieces or sand particles, there is no magnetic iron present. If the larger pieces which may remain in the pan show no disposition to be easily separated from the finer material they should be picked out and laid aside until some way can be found of testing them. If they are not attracted by the magnet they are likely to be tin ore or wolframite, but the latter mineral may easily be scratched by a quartz crystal. Stream tin varies in size. It may be found from the state of fine sand up to pieces of several pounds weight. It also occurs in many colors, the more common being black, brown, red and yellow. A sapphire will easily scratch the smooth surface of a pebble or crystal of stream tin, but a quartz crystal will only make a scratch when a heavy pressure is applied. Tin ore may, owing to its heaviness, be easily separated by panning, from almost any mineral with which it is likely to be associated. Where stream tin occurs it may be panned off in quantities varying from a few grains to as high as several pounds weight to the pan, according to the richness of the gravel. With a good body of tin bearing gravel and facilities for economical working, an average prospect of an ounce or less to the pan should give large profits.

Some attention has been already attracted to tin mining owing to the discoveries in Alaska; but, owing to the reasons stated, there is probably but a small proportion of miners and prospectors who have any practical knowledge of tin and tin mining. The prospecting season is once more approaching and if in the course of his explorations the prospector should come across an extremely hard and very heavy mineral, the appearance of which is unmetallic, and uninteresting, and unsuggestive of value, it might sometimes be worth his while to, at any rate, make sure that the substance in question is not cassiterite.

### The Tombstone District of Arizona.\*

Written for the MINING AND SCIENTIFIC PRESS.

One of the most picturesque mining districts of southeastern Arizona is that of Tombstone in Cochise county. The first mines of the district were discovered in 1878 by Ed. Scheffelin, his brother and Richard Gird, who were among the pioneers of Arizona, the latter being an engineer as well as a prospector and miner. There were eventually more than 1200 claims located in the district, but, as usual, the number of mines developed that proved to be really valuable was comparatively small. The most noted mines of the district were those of the Tombstone Mining Co., the Consolidated Contention Co., Grand Central, Head Center, Virginia, and several others of less value. The output of these mines reached many millions of dollars.

The geology of the district is simple, consisting of sedimentary beds of limestone, quartzite and shale, overlying a granitic formation which extends within 2 miles of the town. There are several beds of



Teaming Before the Advent of the Railroad, Tombstone, Arizona.

quartzite, limestone and other sedimentaries, which have for most part a low angle of dip—20° to 45°. These sediments are found intruded by eruptive rocks, dikes of which cut through the sedimentary beds in a north-south direction, though these intrusions are by no means regular in their distribution. The ore deposits are found in the limestone and shale, and also to some extent in the porphyry, specimens of eruptive rock from the Contention mine showing free gold. The quartzite, as it has been called, lying at the base of the series of sedimentary rocks, is of extremely fine grain, and has been thought to be of deep sea origin, but as it shows scarcely any sign of grain, so dense and compact is it, it seems more probable that it is really a silicification of previously existing limestone, or possibly a silicified shale, and not a true quartzite. In places it passes into the unaltered limestone, which gives color to the assumption that the horstone or novaculite is really a replacement of limestone by silica. This stratum of siliceous cherty rock was usually found to underlie the principal ore-bearing limestone of the region. The sedimentary beds of the district have been compressed into a series of folds, along which the mineralization has chiefly taken place.

The most pronounced fissure of the district passes through the Grand Central and Contention mines, and is thus described by Wm. P. Blake:

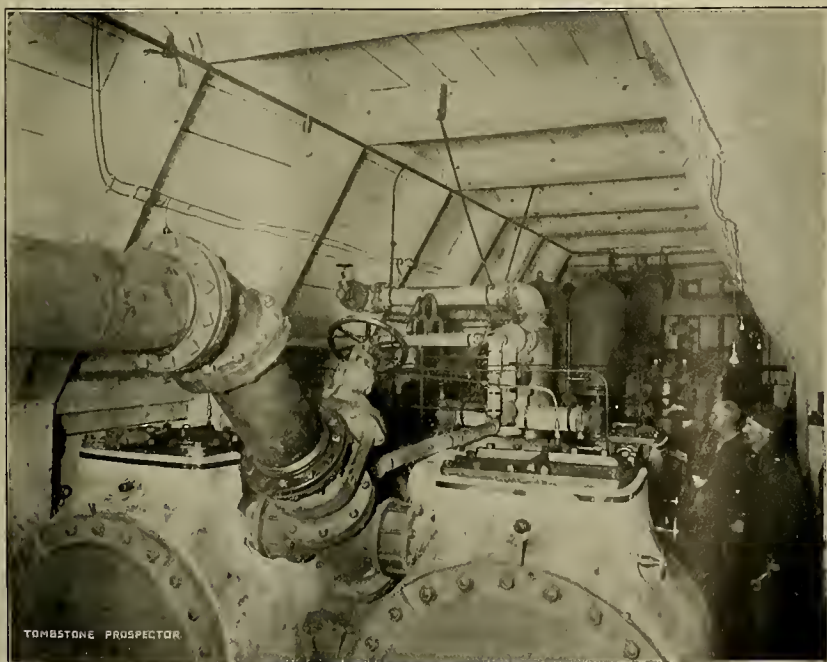
The ores of the district are both milling and smelting. Black oxide of manganese was very abundant in some of the ore shoots. Some of the so-called milling ore contained over 70% manganese oxide, and only 18% to 25% silica, and in the smelting ore samples ran as high as 47% manganese and as low as 26% silica. These ores gave much difficulty in their treatment.

Notwithstanding the difficulties encountered, much of the ore was worked to over 80% of its value. As depth was reached, water began to show in the mine workings. This increased with more extensive and deeper development until there was no longer a profit in mining under existing conditions. The mines were finally closed down and remained practically idle for years. E. B. Gage conceived the idea of consolidating the principal mines of the district, and unwatering the flooded levels. The old workings were mostly useless, the shafts caved and timber decayed, but although the scheme involved the expenditure of a large sum, it was undertaken and successfully carried out. In 1901 a four-compartment shaft was be-

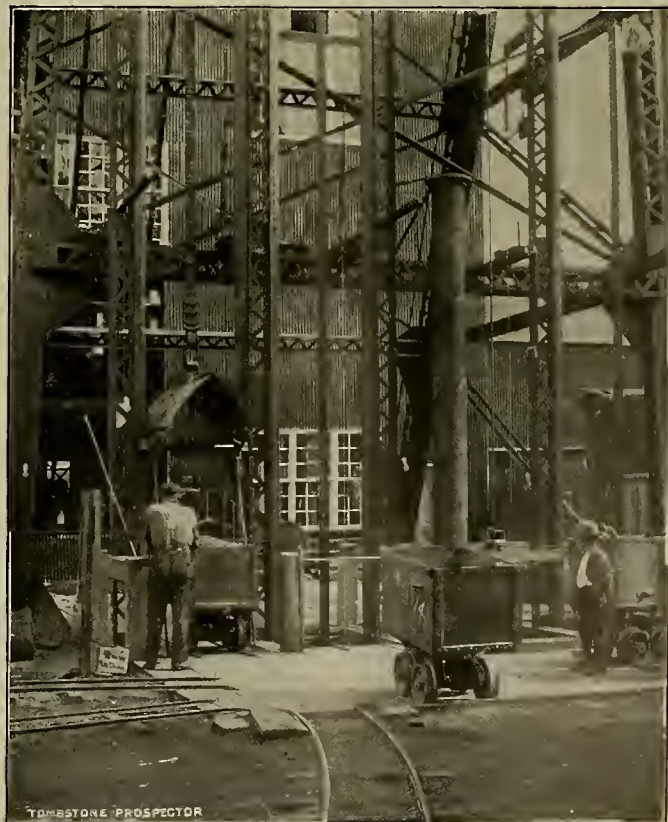
gun on the Contention mine, in size 10 by 24 feet (7 by 22 feet inside timbers). It is solidly timbered with Oregon spruce. An elaborate pumping plant with a capacity of 2,500,000 gallons was installed when the water level was reached, and the development of these great mines is progressing.

Since the former closing down of the mines, commercial and other conditions have changed greatly for the better. A railroad is now within a few miles of Tombstone, pumping machinery is more efficient and the cost of raising water is less than formerly. Mining methods have improved and the great advance in metallurgical science will also aid in making the mines of Tombstone district once more profitable. The accompanying illustrations of Tombstone and its mines are published through courtesy of the Bisbee Daily Review.

The principal claims were located in a north-south direction upon the somewhat obscure croppings of a dike of diorite porphyry carrying ore in, through and alongside of it. This location was made by White and Parsons. The croppings were not remarkably well defined, consisting of the porphyry and a confused mixture of porphyry, chert and quartz, with masses of porous quartzite alongside, none of these rocks rising high above the soil. There was, however, a considerable discoloration of the soil by iron rust along the line, and a little digging revealed good ore near the surface. The harder parts of the dikes were the most prominent, and its direction governed the direction of location of the claim. This dike varies in width from a few feet to 50 feet or 70 feet, and dips to the westward at an angle of from 55° to 65°. It cuts indiscriminately through shales, quartzites and limestones and is evidently of igneous origin. The contact, however, with the abutting edges of the disrupted beds is not always marked by any great change in their appearance or composition, though in places there is obscure metamorphism, impregnations of silica and some modifications of structure. The dike itself has a distinct vertical lamination or structure through most of its substance and is more or less penetrated by veinlets of quartz. In some portions it is highly crystalline and nearly barren, and in others consists chiefly of a feldspathic base,



Pump in Contention Mine, Tombstone, Arizona.



New Shaft of the Tombstone Construction Co., Tombstone, Arizona.

\*See illustrations on front page.



in which the feldspar crystals are obscure. It passes into a felsite, which, in the decomposed portions of the dike and when slaty in structure, might be mistaken for the partly decayed shales or quartzites. Large portions of the dike are so penetrated by quartz as to consist largely of it, and might be called quartz, although close examination will show the presence of feldspar.

A section across the vein of the Head Center mine, on the Contention lode, shows vertical fissures, and a general distribution of quartz in vertical seams. In general, quartz crystals are wanting. Between the vertical streaks of quartz is a filling of feldspar.

There is also a considerable amount of mineralization of the dike by iron pyrites disseminated irregularly in its substance in cubical crystals, most of which have dissolved out and left the cavities only to indicate their former presence, making in some places a spongy mass of porphyry or of quartz. Although the mine has been worked to a depth of 600 feet, and there are some 12 to 15 miles of drifts, levels and winzes in the Contention and adjoining mines, the undecomposed ores below the water line have not been reached and mined, and all the ores above are in the decomposed and oxidized condition common to surface ores. A large part of the ore is highly charged with red oxide of iron to such an extent that the clothing of the miners becomes saturated with the rouge-like powder and the tailings at the mill are blood red.

There has been an extensive decomposition of the porphyry, especially along the upper 300 feet of the dike, resulting in the formation of quantities of white clay, kaolin, sometimes perfectly snow-white and pure, but generally more or less mixed with red oxide of iron. This kaolinization extends in places to the adjoining shales, and there are some white, clay-like, interstratified beds which may on further examination be found to be altered felsitic offshoots from the dike. It is not yet possible to say what the exact nature of the ore below the water level will be found to be. The only metallic contents so far found, with the exception of the pyrites and some galenite and lead carbonate, are gold and silver in a comparatively free state, part of the gold, if not all, being free, and the silver occurring chiefly as chloride, or horn silver (with probably some iodide) in crusts and films, also occurring in minute crystals upon cleavage surfaces. The average value of silver and gold in the ores was about \$70 per ton. The gold in later years increased from 20% to 25% of the value of the product, the rest being silver.

**GOLD IN PORPHYRY.**—One interesting fact is the occurrence of free metallic gold, together with chloride of silver, in the midst of the porphyritic rock, at a distance of many feet from the portions of the porphyry carrying quartz in veins and disseminated. This gold is found chiefly in a portion of the rock apparently dioritic, containing finely disseminated hornblende. In decomposing, this porphyry becomes steatitic and in places appears to be changing to serpentine. The gold is found in thin sub-crystalline flakes and scales, chiefly in and along thin seams and cracks in the mass of the rock, as if it had been infiltrated and deposited from solution. This is probably the fact, and the magnesian nature of the rock has no doubt exerted an important influence in its deposition. Free gold is also found in quartz in the usual manner of association; but even in such specimens the crystalline feldspar of the dike is found.

**METALLIZATION OF THE DIKE.**—The time and manner of metallization of the dike may be considered as open questions, for a solution of which we must wait until the mining extends below the permanent water level of the formation. It seems most probable that the rock at the time of its intrusion was pyritous, and the strata adjoining it no doubt were. It is not impossible that there may have been a concentration of the precious metals in the dike from the surrounding beds, the result of the decay and change of the pyrites diffused in the strata. On the other hand, we may suppose that the dike has been the source of the silver and gold we find in and about it.

In either case the vertical laminated or stratiform structure parallel with the walls has been an important factor in the distribution of the metals and in the changes and modifications of the original condition of the dike. We may readily conceive of such vertical planes of structure affording planes or lines of least resistance to vertical movements, while the abutting ends of the strata, in contact with the walls of the dike, would offer great resistance by friction. The condition of the dike along a great part of its course seems to sustain and verify this hypothesis. There has evidently been considerable movement of parts of the dike upon itself, resulting in the formation of heavy clay seams and brecciated layers of porphyry and quartz, sometimes occupying a medial position along the dike, sometimes on one side or the other, and again along the line of contact with the country rocks. Such seams and brecciated ground are sometimes wanting and the structure and condition of the dike remain unchanged.

The whole of the dike with the adjoining strata have been subjected to extensive movements and displacements, shown not only by breaks of continuity, but by the brecciated cross courses and seams traversing both the igneous and stratified formations.

One of these faults, resulting in a throw of the northern portion of the Contention lode, 150 feet to the west and partly outside of the west side line of the claim, which led to expensive litigation. The faulting seam or break has been drifted upon between the two ends of the disjointed dike. It consists of a heavy breccia of fragments of the adjoining strata, together with a strong clay wall, marking the plane of greatest movement and slip. Its direction is southwest and northeast.

In addition to the lateral movement there have been extensive vertical displacements, and it is probable that the lateral shifting may be referred to them. It would be premature to attempt an exact description of the numerous faults and mechanical changes to which the dike has been subjected.

The movement appears to have been from the west eastward and downwards, the top of the dike being carried off in successive blocks by the sliding of masses of the stratified formations partly upon the planes of deposition of the beds—these dipping eastward and affording surfaces of easy movement—and partly upon steeper planes of fracture generally dipping eastward, as shown in the outline sketch section, which may be taken as typical.

This disruption of the dike, with its attendant fracturing and brecciation of the country rock, accompanied by the movement of the dike upon itself, and the formation of heavy clay seams, has provided favorable places for the accumulation of ore. It is generally found in the softer and most broken portions of the dike, coincident, no doubt, with the regions of greatest original metallization and subsequent movement, attended by clay seams. Such clay seams, with the accompanying ore, have by some been considered as marking the limits of a second or subsequently formed vein; following the dike and independent of it. This theory, formed under the inspiration of the necessity of narrowing down the vein and throwing it as far west as possible, in order to secure a greater length of it upon the Head Center ground, would be more defensible, if in the steeper any vein structure referable to a later deposition could be found. Instead of the fragments of broken porphyry, shale and quartz being cemented together by quartz, they are loosely aggregated and show clearly that the formation is due to mechanical force and attrition. The clay seams are also not certain boundaries of the ore; it occurs on both sides of clay seams. The clay can not, therefore, be taken as separating ore from waste. The seams, moreover, are not continuous, but give out, and in some parts of the dike are absent.

**BEDDED ORE DEPOSITS.**—These also are associated with dikes and vertical fissures nearly parallel with the Contention lode. One of the longest and best defined is the West Side lode, which may be traced for about 2 miles, until it passes into the underlying granite. Its northern prolongation appears to cut across the Toughnut claim and to connect with the vertical fissure and quartz croppings at the Discovery shaft on the Goodenough.

A second line of fissure cuts across the anticlinal line of the formations at the open cut on the Toughnut and crosses the whole breadth of the Goodenough into the Way-Up claim beyond. This has been followed on ore from the open cut to the Way-Up and is connected with the chief lateral bedded deposits. A lode has also been followed in the same general direction from the claim called the Defence, across the Toughnut into the Goodenough. This lode is marked by the heavy croppings of quartz and flinty boulders lying above the limestone on the surface.

In the fissure extending into the Way-Up claim the ore was found in layers and bunches following the plane of the vein, extending upwards and downwards along its course in nearly vertical shoots or ore bodies, but breaking off into the adjoining strata in flat bed-like layers, particularly when the vein intersects the lower limestone resting on the novaculite beds. These bedded offshoots from the vein are often of considerable lateral extent, following the planes of stratification on either side.

In extent the bedded masses of the Goodenough and Toughnut claims have been much greater than the ore bodies of the vertical fissures, and it may be said that the greater part of the production has been from the beds or flats. They extend irregularly between the two fissures a distance of about 400 feet, measured diagonally along the dip. It is noteworthy that they follow the stratification and then suddenly break across it vertically, following a crack or break of the bedding, and then expand again horizontally for some distance to another, dropping down by a series of steps from one layer to another in and between the limestones.

The ores found in these bedded deposits in the limestones are much more plumbiferous than the ore of the feldspathic dikes. Galenite, blende and iron pyrites are abundant in masses, which, within the reach of oxidizing agencies, are largely converted into oxides and carbonates.

THE efficiency of a steam boiler does not depend upon the type of a boiler nearly so much as upon a proper circulation of water and the products of combustion. Boilers of varying types give approximately similar results when all operating conditions are equally favorable.

## THE PROSPECTOR.

There are many who desire to equip themselves and make a prospecting trip this coming spring and summer, and the question has been asked as to the opportunities in Nevada and Arizona, also as to Alaska. It is with some hesitancy that this department makes any suggestion as to a suitable field for the prospector, for several reasons. Among them are the climatic conditions obtaining in each of the three sections mentioned. While undoubtedly at this time any prospect of promise at all in southern Nevada would sell or attract capital more quickly and easily than one in almost any other section of the United States, the hardships, privations and dangers which beset the prospector in that region, whether he be a "tenderfoot" or not, are a sufficient consideration to deserve earnest attention and not to be lightly passed over. The scarcity of water in that vast desert region, the intense heat of summer, the difficulty of getting supplies for men and animals and dangers from reptiles are among the drawbacks to prospecting in southern Nevada, and the same applies to a large portion of western and southern Arizona. However, there are hundreds of miles of desert and mountain still practically unknown between Virginia City, Nev., and Cananea, Mexico. A glance at a map of Nevada and Arizona will show that along a line connecting Virginia City and Cananea, and situated within a very few miles on one side or the other of it, are the following towns, camps and mines: Dayton, Hawthorne, Candelaria, Silver Peak, Tonopah (25 miles northeast), Goldfield, Lida (about 20 miles southwest), Crater (Good Spring and Searchlight are only a few miles from the line, on the west), El Dorado Canyon, Chloride, Mineral Park, Cerbat and Stockton Hill, in Mohave county, Ariz. The San Francisco district, where are located the Gold Roads and other important mines, is but a few miles to the westward of the line. Continuing southward, the line passes through Hillside and Santa Maria districts, Wickenburg, Harqua Hala, Congress, Vulture, Florence, Tombstone and Bisbee, Ariz., and Cananea, Mexico. It may be argued that this is merely a coincidence; but the fact remains that along this line are some of the most noted mines and mining districts of the Southwest. It is true there are scores of good mines and noted districts at long distances away on either side, as, for instance, Jerome and the district about Prescott and southerly from there. And in southern Nevada there are numerous rich mines and districts far removed from this imaginary line. Still the fact remains that good mines have been developed along this particular line, and it is improbable that all have been found. The desert region between Goldfield and El Dorado canyon appears to offer the greatest possibilities at this time, for the reason that it has received less careful attention than those sections more easy of approach and where water is more readily obtainable. In the direction of the line here referred to there is a large area in Arizona, in Yavapai county, covered by a floor of basalt that is from 200 to 1200 feet deep, and it is only where erosion has cut down to the older underlying rocks that prospecting can be carried on. As to Alaska, it is probable that the tributaries on the west side of the Yukon river in American territory offer as good inducements and advantages as any other for gold, particularly when capital can be had for development. The indications are that there will be a considerable development of copper in Alaska along the islands of the coast and in the interior also.

The ore from the Empire mines, Grass Valley, Cal., contains chiefly zincblende, a small amount of chalcophyllite, a smaller amount of pyrite and a bright, scaly, metallic mineral having the luster of bright galena, but which is semi-sectile and is probably nagayagite, a sulpho-telluride of lead and gold, and, according to Dana, containing also about 7% antimony. The mineral occurs in such small amounts that tests are difficult to make, but it seems to answer to all the properties ascribed to nagayagite. Free gold is also present in the specimen. The only gangue mineral observed is quartz. This visible gold is for most part closely associated with the blende.

The mineral from Oro Fino, Siskiyou county, Cal., carrying gold is baryta (barium sulphate), often called heavy spar. A small amount of strontium sulphate (celestite) is also present. This is a combination seldom gold bearing. The honeycombed structure is due to the removal of some soluble constituent.

There are a great many kinds of copper ore, but the ores producing the greatest amount of copper are the low-grade chalcophyllite ores of many mining districts all over the world. Copper glance and bornite are also mined extensively, but in much less amount than chalcophyllite. The oxidized ores—malachite, azurite and the black and red oxides—are of comparatively little importance, though they constitute the principal source of the metal in some districts.



# Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 14, 1905.

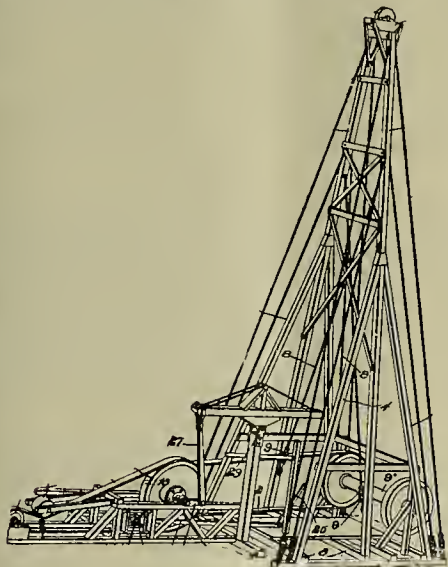
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ELECTRIC HEATER FOR OIL OR GAS WELLS.—No. 784,454; F. B. Waring, Lima, Ohio.



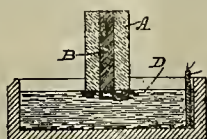
Heater for oil wells comprising pair of supports having plurality of openings, plurality of tubes having ends extending in openings and hermetically connected to supports, heating devices extending through tubes and out of contact therewith, means carried by supports for centering heating devices within tubes, binding posts carried by one of supports and connected with heating devices, and leading-in wires connected to binding posts.

WELL DRILLING MECHANISM.—No. 784,571; J. C. Knupp and J. G. Greene, Warren, Pa.



In device of class described, driven shaft carrying band wheel and tug wheel, shaft having crank, walking beam, pitman connecting walking beam with crank, sand reel carrying shaft, permanent support for one end of shaft, box forming bearing for other end of shaft, box having upward and downward extending trunnions, longitudinally slidable frame having bearings for trunnions, friction wheel upon sand reel shaft adapted to engage band wheel, brake block adapted to engage friction wheel, and means for manipulating slidable frame.

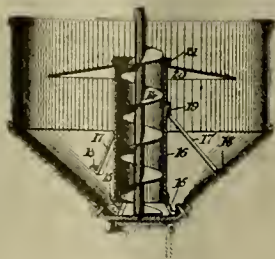
METHOD OF EXTRACTING METALS FROM ORE BY ELECTRICITY.—No. 784,885; E. L. Priest, Oakland, Cal.



Method of extracting metals from ores by electricity, consisting in forming body of comminuted ore

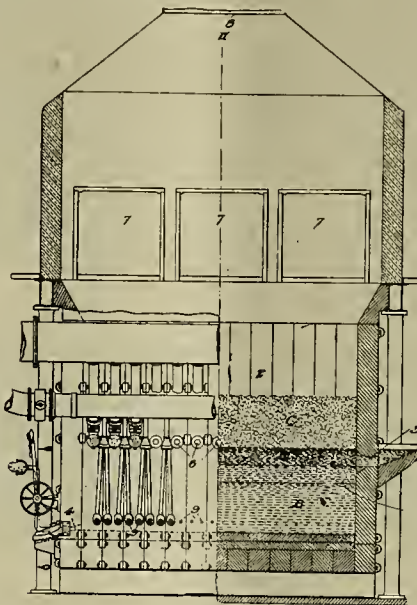
into coherent mass, associating electric conductor with same, and positioning mass with its conductor in contact with liquid electrode and passing electric current through same to form arc therebetween.

CYANIDE AGITATOR.—No. 784,598; E. Stevens, Leadville, Colo.



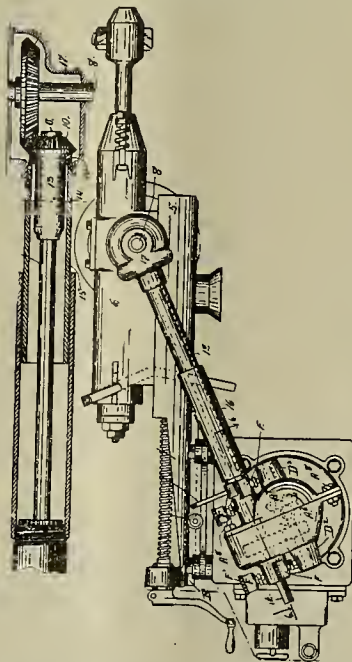
Combination of containing vessel provided with frusto-conical portion, basin engaging frusto-conical portion, basin being provided with bearing, tubular member disposed within containing vessel, and revoluble shaft provided with carrier thread disposed within tubular member, revoluble shaft being provided with journal engaging bearing within basin.

METHOD OF SMELTING ORE.—No. 784,651; R. Bagaley, Pittsburg, Pa.



Method of producing matte which consists in forming molten bath of matte and charging body of ore in such limited quantity that it will float with bottom above bottom of furnace, and blowing air into bath.

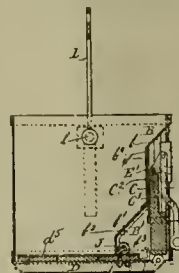
MEANS FOR COUPLING MOTORS TO ROCK DRILLS.—No. 784,757; J. H. Redfield, Denver, Colo.



Combination with guide shell, of rock drill or similar machine, of electric motor yieldingly suspended therefrom, and operative connection between motor

and drill, including tubular telescoping parts whereby coupling is extensible to compensate for back-and-forth movement of drill body on guide shell.

DUMPING BUCKET.—No. 784,815; G. L. Stuebner, Flushing, N. Y.



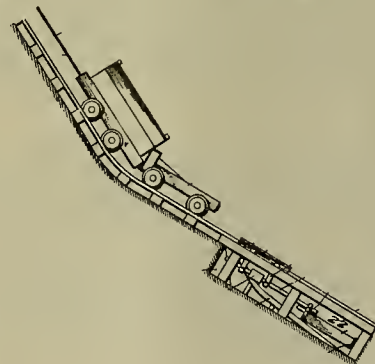
In bucket combination of hinge, bottom swinging from hinge and extending on opposite sides thereof, pocket in bucket, counterweight guided in pocket with its lower face arranged to bear against one of ends of swinging bottom, latch hinged to bucket and arranged to bear against top face of counterweight.

DETACHABLE TOOL HANDLE.—No. 784,772; W. Ashert, Des Moines, Ia.



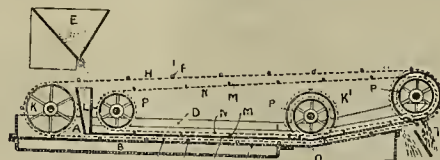
Combination with tool having handle eye and also having notches adjacent to upper end of handle eye, of cross piece resting in notches and formed with central opening, handle socket having body portion introduced into handle eye, body portion formed with notch at upper end to receive cross piece and screw-threaded rod passed through cross piece and seated in socket.

MECHANISM FOR HAULING AND CONTROLLING OF CARS.—No. 784,898; J. G. Scott, Girardville, Pa.



In mechanism for hauling and controlling cars, track comprising single pair of rails for car and "barney," rails being provided with switch sections nominally open when "barney" is on main track, and adapted to be positively closed by movement of "barney" into its pit.

APPARATUS FOR SEPARATING AND CONCENTRATING MINERALS.—No. 784,999; G. A. Goyder and E. Laugh-ton, Adelaide, South Australia, Australia.



Apparatus for separating minerals and extracting some of them as concentrates consisting of vessel adapted to contain solution, floor of such vessel being partly horizontal and partly inclined and provided with means for heating solution, feeding hopper extending across one end of vessel adapted to feed ore or minerals in finely divided state, series of transverse rod rakes, and means for moving them at regulated speed along bottom of vessel from feed to discharge end, inclined deflectors along and above bottom of separating portion of vessel, trough receptacles arranged parallel with deflectors and at such distance from bottom of vessel as to enable gas raised particles of mineral to be deflected, guided, deposited and collected therein, sloping extensions of troughs and angular rakes for discharging concentrates from troughs through sloping extension of vessel.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The Mansfield G. M. Co. has resumed work on McGinnis creek, near Juneau. G. W. Otterson is manager.

Fairbanks, one of the newest centers of the northern rush, had 10,000 people last January, and expects to double that next year. The prices of some of the necessities of life there last January were as follows: Flour, per cwt, \$13; meat (fresh) per pound, 60c to 75c; pork, 50c; potatoes, 20c; dried potatoes, 60c; corn meal, 20c; rolled oats, 20c; rice, 20c; beans, 20c; sugar, 50c; dried fruits, 50c; lard, 33c; butter, \$1; canned vegetables, per can, 50c; condensed milk, for three cans, \$1.25; coal oil, per 5-gallon can, \$8.

It is reported that Fairbanks and Chena have lost their floating population in a stampede to the Little Delta district, 100 miles above Fairbanks, in Tanana valley. New strikes there are making a better showing than at any creek in the Fairbanks district. At Tenderfoot creek coarse gold running 11 cents to the pan has been found at a depth of 3 feet; at Little Delta it averages 10 cents, and along Gerstle river 8 cents. Three rival townsites have been staked, Roosevelt City having a population of 300. Tenderfoot will be another town. Not since the discovery of gold on Pedro creek, two years ago, has there been so much excitement in Alaska.

### ARIZONA.

(Special Correspondence).—The Twenty-third Arizona Legislature has adjourned, and all the bills affecting the mining industry failed of passage. The hullion tax bill, the bill providing for a mining inspector and the bill prohibiting the use of any form of evidences of indebtedness in place of cash in payment of wages all were safely side-tracked and pigeon-holed. Some of the legislation aimed at Arizona mines was meritorious, but the mining interests exerted every effort to prevent its passage and was powerful enough to be successful. The hullion tax law was the measure of greatest importance, framed with the idea that the big producing mines of the Territory were not contributing their share to Territorial funds. Affecting as it would only the producers, the law if enacted would not have had the deterrent effect on the mining industry, which, it was argued, it would have and would have added greatly to the revenues of the Territory.

Phoenix, March 20.

#### Cochise County.

(Special Correspondence).—C. B. James, general manager for the Cochise Con. Co., will purchase machinery for their concentrating plant to be built on their property near Paradise. A large quantity of ore is stacked ready for concentration. It is expected the concentrator will be ready for operation about July 1.

Paradise, March 20.

(Special Correspondence).—Contracts representing \$300,000 have been let by the Copper Queen Co. at Bisbee for the development of the Douglas smelter. Four engines to run the new blowers were ordered, each of which will have a capacity of 12,000 feet of air a minute. A contract was let for an air compressor with a capacity of 3000 cubic feet. A blower was ordered for a converter, to have a capacity of 12,000 cubic feet of air a minute. The production of hullion copper at the reduction plant of the Copper Queen at Bisbee for the month of February broke the record of production for the Southwest for any one month since the copper has been mined, being 7,012,000 pounds.

Bisbee, March 20.

#### Mohave County.

(Special Correspondence).—P. H. Smith, A. H. Smith and M. A. Sawyer have located a deposit of wolfram ore on the east side of the Cerbat range, 6 miles north of Kingman. The ore occurs in massive dykes of feldspar. Kingman, March 20.

The Mohave mine, near Vivian, has put in a hoisting plant and is sinking a shaft.—It is understood that A. J. Pickrell will develop the Maguire mines, south of Kingman.—The mine operators of Gold Road and surrounding camps are reported to have formed a mine operators' association similar to that at Cripple Creek, Colo.

#### Yavapai County.

(Special Correspondence).—The Yaeger Canyon copper mine in the Black Hills district, near Prescott, has sunk the main shaft down to the 800-foot level, and a drift has been run 600 feet along the foot wall of the ledge. The recent rains have made hauling difficult and the company's ore bins are overflowing. The company has a hoisting engine of sufficient capacity to work to the 1500-foot level. R. E. Sloan is manager. The formation is diorite and slate, showing three principal ore bodies occurring as fissures in diorite.

Prescott, March 20.

### CALIFORNIA.

#### Amador County.

The shaft of the Climax mine, 5 miles east of Jackson, is down 200 feet. The ledge matter has widened to 6½ feet. Drifting will begin 100 feet below the upper levels. A 10-stamp mill will be built to take the place of the 2-stamp mill. The company will employ between twenty and thirty men when the new mill is put into operation. P. B. Aiken is superintendent.—At the Zella mill, near Jackson, forty stamps are dropping. New levels are being opened up at 1450 and 1550.—The Central Eureka mine at Sutter Creek produced in January 4800 tons of ore valued at \$29,200. The ore averaged \$6 to \$8 a ton. The main shoot has been sunk on an incline to a depth

of 2380 feet, all in ore from the 1000-foot level. A ten-years' contract has been let for electrical power to run the 40-stamp mill and rock breaker, and later on it is expected to operate the hoist by the same power.—The drift being run from the Lincoln shaft to the Mahoney mine at Sutter Creek is in 650 feet.

#### Butte County.

H. H. Yard and W. P. Hammon of Oroville are making arrangements to work auriferous gravels in Butte and Plumas counties by means of steam shovels which will load the dirt and gravel in flat cars, by which it will be carried to convenient sluiceways, where it will be unloaded by water from hydraulic nozzles. Preliminary estimates of cost place digging at 5 cents per cubic yard, hauling 1 cent per cubic yard and unloading and sluicing at 3 cents per cubic yard.

#### Del Norte County.

The Klamath River Dredge M. & D. Co. intends working 2100 acres of mineral land extending from mouth of Klamath river inland, 22 miles, in Del Norte and Humboldt counties. The principal place of business is at Dunsuivre. J. B. Dougherty is president and D. O. Tupper secretary and treasurer.

#### Calaveras County.

Shaft sinking has been commenced at the Port Arthur mine, near Altaville, by Superintendent Lewis Lane.—The shaft of the San Andreas Blue Gravel Co. has been enlarged and retimbered to a depth of 75 feet and is now being continued to bedrock by Superintendent G. A. Stewart of San Andreas.—The Benson mine, 4 miles west of San Andreas, has put in an engine and air compressor.

#### Lassen County.

(Special Correspondence).—A rich vein has been struck on the 300 level of the Lassen M. Co.'s mine on Hayden Hill. The vein is from 2 or 3 inches to a foot in width and runs \$250 per ton gold. There are two principal fissures in this mine crossing each other at an angle of about 30° to 40°. There seems to have been some displacement at the intersection, resulting in the brecciation of a considerable mass of rock, which has been since altered and much decomposed, with the infiltration of silica and gold, a large valuable ore shoot being formed, which has been extracted. In the progress of development it has been observed that pockets of gold formed on and near the walls of this ore chamber where several seams or veins entered it from the surrounding barren walls. Several of these seams have been drifted upon and in almost every instance the seams have led to rich deposits or veins of gold-bearing rock. The recent strike is one of these occurrences, but has the appearance of being more permanent and valuable than the most of those formed heretofore.

Hayden Hill, March 18.

#### Mariposa County.

The Champion mine, 1 mile north of Coulterville, has been hounded to C. E. Van Meter and the work of unwatering has been finished. The shaft is 200 feet deep.—The Columbus Con. G. M. Co. has completed surveys and maps of their property, near Coulterville, preparatory to commencing work on an extensive scale.—At the Mt. Gains mine, east of Hornitos, the old dump is being milled with a Huntington mill. F. E. Long is the general manager.—W. H. Cavin is running the Organita mill on ore from the Grimshaw mine, near Mariposa. At the Grimshaw ten men are at work. The shaft is down 200 feet.

#### Placer County.

It is reported that P. S. Lozano of Ophir intends putting machine drills on the Bellevue mine.

#### San Francisco County.

The auxiliary electric power plant which is intended to supply power for the operation of the United Railroads in the event of any interruption in the long-distance transmission lines of the California Gas & Electric Corporation, after that company enters upon its power contract with the railway corporation, is being built on the bay shore at South San Francisco. According to the company's plans for the big power plant, there will be installed at the South San Francisco works the largest gas engines ever constructed in the United States. There will be three of these engines, each of 5333 H. P., or a total of 16,000 H. P., as against 12,000 H. P. now developed at the power stations of the United Railroads. These engines will each be directly connected to a three-phase, 4000 kilowatt, 25-cycle alternator. There will also be two motor-generator frequency changers, having an output of 4000 kilowatts each. The main building of the power station will be 200 feet in length by 90 feet in width, which will accommodate three engines, motor generators and exciter sets, with an addition 36x80 feet in size, in which will be installed a storage battery, high-tension transformers, pumping apparatus and the general operating switchboard of the station. Outside of the main building there will be storage tanks, cooling tanks and other apparatus. In connection with the gas engine station there will be an oil gas plant for the manufacture of oil gas and a storage gas holder of 1,000,000 cubic feet capacity. The construction of the power plant, buildings and gas engine units, together with the high-potential transmission lines connecting the power station with the seven water power plants of the company, will be in charge of F. G. Baum, transmission engineer of the company. The erection of the gas plants and their equipment will be in charge of E. C. Jones, gas engineer of the company.

#### Shasta County.

The Rising Star mine of the Bully Hill Copper M. & S. Co. at Winthrop is supplying the furnace with 125 tons daily. The Northern Light, adjoining the Rising Star, is bonded to the Bully Hill Co. and is being prospected by drifts running from the Rising Star. In the Bully Hill claim the shaft is down 870 feet, where a station large enough for a hoist is being cut. J. B. Keating is superintendent, H. C. Anchor assistant superintendent Rising Star mine, M. Thomas assistant superintendent Bully Hill mine, H. Hanley engineer and surveyor, Ed Wilson assayer, Geo. Nagle and Geo. Krause smelter foremen. Bully Hill rises 1200 feet above the surrounding country and is composed chiefly of rhy-

olite, with three mineral veins striking north and south. The ore occurs in shear zones in rhyolite and metabasite dikes, all of superficially slaty structure, the lenses having a clay gouge of 1 to 30 feet on one or both walls. The main ore bodies below the zone of secondary enrichment carry chalcopryrite associated with pyrite, also hornite and chalcocite, with occasional carbonate and oxide ores and native copper. It is expected that the 300-ton smelter will be running full capacity by July. The smelter is 39x100 feet in size, with a 90-foot stack. The reduction plant is terraced, handling all material by gravity, and has roast stalls in series, with two McDougall caking furnaces and two 42x120-inch blast furnaces, making matte of 35% to 50% tenor, which is taken in ladles by a 20-ton electric traveling crane to the conversion department, which has two stands of converters, turning out 98% blister copper, which is shipped to New Jersey for refining.

Following the announcement of the granting by the United States Circuit Court of a permanent injunction, enjoining the Mountain Copper Co. from allowing the fumes to escape from its smelter at Keswick to the destruction of vegetation, the Mountain Copper Co. has notified those mines which have been furnishing siliceous ores for fluxing purposes that no more ore would be received. Several of the mines affected are contemplating putting up stamp mills to treat the ores at the mines. The Crown Deep mines on the Shasta road, west of Redding, J. Hulme, managing owner, and the Reid mine in Old Diggings, near Redding, under bond to J. Sallee of San Francisco and D. B. Hunt of Redding, are among those affected.

It is reported that Delamar's Bully Hill mine and smelter have been sold to the General Electric Co. of Schenectady, N. Y., for \$1,000,000. Anticipating the deal, H. A. Cohen, former consulting engineer for Delamar, filed an attachment for \$50,000 on the land embraced in the Delamar holdings. The Bully Hill property includes seventeen lode claims and one placer claim, all patented, aggregating 213 acres. The ore lies in lenses connected by narrow seams of ore. Limestone and ironstone for fluxing are obtained on the McCloud river, about 6 miles distant. Sufficient silica is obtained from the mine.

#### Siskiyou County.

At the New York quartz mine at Indian creek, 30 men are at work. The ledge has been developed to a depth of 900 feet and the 10-stamp mill is in operation constantly, being run by electric power from the Siskiyou Electric Power Co. J. B. Scott is superintendent.—A. C. Brokaw is crushing the ore from the Golden Eagle quartz mine at Indian creek, with a steam power stamp mill, which he expects to enlarge and run by electricity when the ledge is more thoroughly developed.—Baker & Co. have a ledge on Indian creek, which they are developing with a small steam power mill. Bryant & Co. have completed a 10-stamp mill at Deadwood. Perry Elmore has leased his mine on north fork of Humbug to Louis A. St. John and A. H. Lamm for Eastern capitalists, with option of purchasing.—The Yreka Journal says that the project of dredging Oro Fino creek is likely to prove a paying enterprise, as it has always paid by hydraulicking the banks.—Men are working the Gardner & Eastlick hydraulic mine at Oro Fino. They have plenty of water for the elevators and are running night and day.

#### Trinity County.

A storm in Trinity county carried out the ditch furnishing the Fairview mine at Minersville with water, and milling has been suspended.

#### Tuolumne County.

Superintendent M. D. Kelly has started twenty stamps at the Jumper mill at Stent.—A steam hoist has been put on the Omega, near Jamestown, and sinking is being continued in the shaft. Machine drills are to be used. C. W. Ayers is superintendent.—Electric power is to be used at the Clio mine, near Jacksonville.

C. F. Brownlee has deeded to W. P. Huston of Angels a half interest in the Wickham quartz mine, near Tutletown.—A rich shoot of ore has been struck at the App mine at Quartz. In the mill 60 stamps are dropping.—It is reported the Platt & Gilson vein has been struck at the Soulsby mine at Soulsbyville.

#### Yuba County.

Roberts & Brown are putting up a 5-stamp mill at Brown's Valley, to work ore from the dumps.—Stephens & Whittier are taking out ore from the Last Chance and will haul it to the new mill at Brown's Valley.

### COLORADO.

(Special Correspondence).—As the long continued governorship contest has at last been settled, it is earnestly hoped that the mining and business interests of the State will continue to improve. From information gathered from the manufacturers and sellers of mining machinery and supplies, the inquiries for machinery of different kinds and prices thereon have been heavy the past month or two, and they are of the opinion that the orders will now commence to come in. The Governor, Jesse F. McDonald, is a mining operator of Leadville. Indications point to a large number of new mills going up this coming season. Last year mill building in Colorado was at low ebb. A large number are now under construction and plans are being made for several others.

Denver, March 20.

#### Clear Creek County

Work has been resumed on the American Sisters mine, near Georgetown, which has been idle since August 28, 1893, when the mine buildings and machinery were destroyed by fire. Machinery is being put over the Headlight shaft. The shaft is now 160 feet deep and will be sunk another 150 feet.

The Rockford tunnel of the Colorado D. & I. Co. being driven on Clear Creek, 2 miles above Idaho Springs, to open up the Turkey Creek claims, is in 800 feet. The Rockford tunnel is 5x7 in the clear and has cut four veins. Machine drills and a 4-drill compressor are to be put in, to drive 3000 feet farther. Arrangements have been made to develop the Centurion and Golden Hills mines through the tunnel and transport ores that are now being hoisted.



OFFICIAL ESTIMATE OF THE VALUE OF COLORADO'S MINERAL PRODUCTION BY COUNTIES FOR 1904.

COUNTY.	Gold.	Silver.	Lead.	Copper.	Zinc.	Total.
Arapahoe.....	\$ 218 04	.....	.....	.....	.....	\$ 218 04
Archuleta.....	124 92	5 72	.....	.....	.....	129 71
Boulder.....	411,581 04	32,858 01	2,670 77	3,348 73	.....	450,458 55
Chaffee.....	64,315 71	39,507 55	28,016 23	33,755 14	15,916 44	180,671 07
Clear Creek.....	696,015 33	500,073 02	170,304 07	51,443 61	46,241 05	1,404,739 18
Conejos.....	820 40	20 75	.....	.....	.....	841 15
Costilla.....	808 14	86 40	.....	.....	.....	894 54
Custer.....	53,462 62	40,004 83	5,443 50	1,032 17	.....	119,823 12
Delta.....	351 39	5 15	.....	.....	.....	356 54
Dolores.....	53,783 34	01,960 83	7,782 85	3,256 02	928 00	127,730 04
Douglas.....	289 38	2 86	.....	.....	.....	292 24
Eagle.....	30,074 55	15,643 53	16,133 90	4,155 81	.....	66,013 09
El Paso.....	810 05	.....	.....	.....	.....	810 05
Fremont.....	4,071 42	119 92	46 05	121 31	.....	4,378 70
Gilpin.....	1,403,865 96	182,191 91	36,949 60	81,031 92	.....	1,704,038 49
Grand.....	516 75	8 01	.....	.....	.....	524 76
Gunnison.....	440 77	13 16	.....	.....	.....	453 93
Hinsdale.....	26,923 53	05,890 55	8,610 87	2,081 50	1,020 51	103,539 02
Huerfano.....	19,521 03	20,655 04	44,772 55	1,990 97	3,913 54	80,651 03
Jefferson.....	351 39	.....	.....	.....	.....	351 39
Lake.....	1,186,850 73	2,969,723 49	2,928,777 30	478,880 30	2,970,072 90	9,575,310 19
La Plata.....	127,400 88	17,757 08	3 61	188 88	.....	145,149 45
Larimer.....	1,178 19	0 20	.....	.....	.....	1,178 39
Lincoln.....	222,863 94	052,503 00	573,890 75	171 44	224,637 55	1,073,982 63
Mineral.....	1,488 24	010 54	.....	.....	.....	1,498 78
Mesa.....	218 04	5 15	.....	.....	.....	223 19
Monte Vista.....	2,700 45	.....	.....	.....	.....	2,700 45
Moravia.....	2,157,268 89	168,242 23	247,971 58	53,881 00	220 93	2,607,383 63
Ouray.....	194,080 11	28,017 41	32,581 23	750 12	.....	255,437 90
Park.....	2,335 71	1,218,507 42	811,964 74	1,264 60	30,276 71	2,064,409 18
Pitkin.....	4,900 98	1,305 19	.....	83 35	.....	6,289 52
Proter.....	24,235 24	103 57	.....	.....	.....	24,338 81
Rio Grande.....	5,518 89	44,821 53	30,079 42	6,247 62	794 31	77,253 29
San Juan.....	1,306,651 23	506,257 58	399,411 65	444,589 31	16,179 95	2,653,080 72
San Miguel.....	1,531,088 24	82,063 66	243,393 44	30,713 65	.....	2,188,147 99
Summit.....	208,120 23	103,313 99	03,661 82	163 03	4,585 56	410,641 63
Teller.....	14,450,535 90	27,360 89	.....	8 08	.....	14,483,004 96
Totals.....	\$24,223,007 64	\$7,416,156 00	\$4,624,514 73	\$1,205,607 31	\$3,313,787 97	\$40,783,074 25

NOTE.—In the above table the calculation is on the average market price of the metals for the year: Gold, \$20.37; Silver, \$0.5723; Lead, \$0.913; Copper, \$0.1223; Zinc, \$0.954. Zinc is figured on actual spelter recovered.

Denver County.

Directors of the American Mining Congress, in session at Denver, have decided to erect a mining temple in Denver to be used as headquarters, and also to gather together a permanent mining exhibit. The following directors were present: Thomas Ewing of San Francisco, Cal.; G. W. E. Dorsey of Fremont, Neb.; E. Buckley of Rolla, Mo., and A. W. Gifford of El Paso, Tex.

Fremont County.

W. H. Murray of Parkdale has sold the Isabella mine in Smith gulch, near Canon City, to Boden and Haskins of Leadville, for \$20,000. The mine will be operated on an extensive scale, arrangements having been made by the new owners to sink a 300-foot shaft and begin the work of production.

Gilpin County.

It is reported that the California mine, near Nevada, is to be reopened. The main shaft is down 232 feet and is said to be the deepest gold mine shaft in Colorado.

F. C. Young, manager of the Gunnell M. Co. of Central City, says that the company is operating all their mills on Clear creek, and that by summer they intend to have the shafthouse of the Gunnell mine in Eureka gulch, which was destroyed by fire last summer, rebuilt, and active operations on the property will then be resumed. A new plant of machinery will be installed to replace that which was also damaged by the fire.

The Caledonia mine in Lake district, near Central City, owned by the New National Tunnel M. & M. Co., has been started up under the management of G. W. Adams. The property is equipped with a gasoline hoisting plant and the shaft has been timbered and put in good condition from top to bottom, a depth of 400 feet. Sinking operations have been carried on to carry the shaft down 200 feet farther. Drifting is being carried on in the 300 west and in the east and west 400-foot levels, stoping being carried on in the 400-foot west level. Shipments are made to the Rocky Mountain concentrating works in Black Hawk. The tunnel is in 2100 feet. Machine drills may be put in.—John Eilmann and F. Wenzel, both of Central City, have struck high-grade ore in the Susan Mary mine in Lake gulch.—The Register-Call reports that drifting is being carried on in the 400 and 500-foot west levels of the O'Neill mine on Bortail hill, operated by the Ontario-Colorado M. Co., with H. C. Eastman as manager. The 500-foot level is being extended to get under the large ore body, but Superintendent H. Bowden says it will be necessary to drift 180 feet farther in this level before they can get under the ore body from which they are taking out shipping ores in the 400-foot level. Rand air drills are being used in these two levels and good headway is being made.—A 3x4x12 Jeaneville pump, size 6, is being put in by the Boston-Occidental M. Co. at American City, in the Pine Creek district.—Central City parties are working the Dump mine on Bortail hill under a lease and bond from the Arrighi estate, and they are keeping up both development work and extracting a good grade of ores. The shaft has been sunk 300 feet. Drifting is being done in the east and west levels at a depth of 280 feet. They are at present operating with a whim for hoisting, but may put in a small plant of machinery for deeper operations.—It is reported that active operations are soon to be resumed on the Chemung-Belmont, which will include the deepening of that shaft. The property is owned by Black Hawk people and is under lease and bond to the Central Bonding & Leasing Co. The present shaft is down 700 feet.—The Puzzle mine in Gregory district is being operated under a lease by W. Martin of Central City.—Superintendent Kirk will sink 100 feet from the 400-foot level of the Castleton mine on Pewabic mountain, near Central City, as soon as the new hoisting plant is completed.

Gunnison County.

(Special Correspondence).—The Continental gold mine at Vulcan is to put in a mill. J. Schreier, Jr., an owner, has returned to after a two months' visit at the mines. D. C. Tobin is superintendent.

Vulcan, March 21.

The Baalbeck M. Co. has its tunnel on its properties below Hancock in 900 feet. A drift on the big fault encountered for 100 feet caught the ore shoot again and the company expects to soon be shipping ore. T. B. Crawford of Denver is interested.—T. C. Clayton of Denver will soon commence a tunnel into Brittle Silver mountain, east of Sberrod.

At Pitkin Linn, Langill & Smith are drifting and sinking on the Sultana.—The incline shaft of the Cortland mine, near Pitkin, is down over 230 feet, with a vertical depth of 185 feet, in the bottom of which is showing a 10-inch vein of high grade silver ore.—The Gold Links tunnel is in 1100 feet and being driven as rapidly as possible with three drill shifts of one drill each. Some days as much as 10 feet are made.—Work on the Grand Prize is under the supervision of W. Friend of Pitkin.

F. O. Ensign is sinking 100 feet on the Cortland mine, near Obio City. The Cortland dump is to be treated in the Jersey Blue mill. Near Obio City work has been resumed at the Golden Eylet, Chloride and Philips.

Lake County.

The Belgian mine, in Adelaide park, near Leadville, has arranged with the Yak tunnel people to drive a lateral from the tunnel level 1500 feet to the shaft of the Belgian. This means that the property will be drained of water, as well as the other claims in the neighborhood, and when the lateral reaches the shaft a raise will be made to connect the two. When the Belgian is reached and the ore body opened all of it will be taken out through the tunnel.

The Nil Desperandum Co., at Leadville, has put in extra boilers and pumps to handle the water so that sinking can be resumed in the shaft.—The Penrose Co., at Leadville, has put in new pumps to reduce the water level in their mine.

The Manhattan M. & P. Co. has resumed work on its crosscut being run to cut the Keystone ledge at Willis Gulch, near Twin Lakes. O. P. De Ford is president.

Ouray County.

D. L. Brown has commenced work on the Bullion property on a lease and is cleaning out the shaft and making ready for running on the vein.—Lack of coal has caused the Treasury tunnel, near Ouray, to be closed down.—It is reported that the Bagley tunnel, near Animas, is in 400 feet and has intersected a body of lead-silver sulphides of good values. Ten men are at work.—W. R. Kramer has started work on the Governor, near Ouray.—The Revenue Tunnel Mines Co. of Ouray are working 250 men, and will probably increase the force to 400. The water is under control.

San Juan County.

The Green Mountain Co.'s new 75-ton concentration plant near Howardsville is expected to be in operation by July 15. Ed. Walter is manager.

The Boston & Silverton M. & R. Co., at Silverton, have struck good ore in the Yukon tunnel, at a vertical depth of 1500 feet, 2135 feet from the tunnel mouth. A. A. Lamont is superintendent.—The Mollie Mack group, on the northwest slope of Boulder mountain, is to be worked by the Little Rea G. M. & M. Co., of which E. W. Hunt of Silverton is manager. A 2000-foot tunnel will be driven to work the vein.

San Miguel County.

The 50-stamp mill of the Ophir Con. M. Co. at Ophir Loop has been remodeled to handle the tungsten ore and is expected to start May 1.—The 80-stamp mill of the Liberty Bell mines at Telluride is expected to be ready for work on April 10. More men are being put on at the mine and the force will probably be increased further when the mill is started. The Stilwell tunnel being run to cut the Liberty Bell vein, 900 feet below the upper workings, is in over 1000 feet.—Wagner Bros., lessees of a portion of the Smuggler-Union mines and dumps at Telluride, who are working twelve men, will be employing seventy-five men, it is reported, by April 1. They expect to work the dumps extensively. It is calculated there are 3,000,000 tons of mineral in the dumps, some of which carries higher values in gold and silver than the bulk of the mineral which is being extracted from the mines at the present time.—King & Lindsey, lessees of another portion of the Smuggler-Union, with a force of 100 men, are taking out and sending to the Smuggler-Union mills, at Pandora, for treatment an average of 200 tons of ore every twenty-four hours. Besides the milling rock, they are sacking considerable high grade ore as it is taken from the mines, which is shipped direct to the smelters. They have thirty men working on their lease on the Sheridan mine, and will soon begin shipping.—At the Butterfly-

Terrible mines and mill, at Ophir Loop, Manager F. J. Keating reports that the mill is running to its full capacity and treating ten tons daily.

Teller County.

The Isabella Mines Co. of Cripple Creek has ordered a hoisting plant for the Empire State shaft, and a compressor and drills. The hoist is of first motion, good for 2000 feet. Sinking will begin at the 800-foot level and conclude at 1300 feet.

The Snowshoe M. & M. Co., on Sheep mountain, north of Gillett, will start work April 1 on the shaft of the Snowshoe claim No. 1, which is now down 200 feet. Crosscutting will be started to cut the vein which was uncovered at a depth of 100 feet. On the Snowshoe No. 2 the shaft, which is down 75 feet, will be sunk to the 150-foot level. Manager J. Parfot will work twenty-five men.—The Mountain Boy Leasing Co. has a two-year lease on the Mountain Boy and Bogart claims, on Raven bill, Cripple Creek. The company will operate through the Opbelia tunnel, which has cut the claims at depth of 1000 feet.—The Sioux M. Co. will start operations April 1 on the Flourine property on Copper mountain. The company is raising from the tunnel to make a connection with the old open stope. This will permit of the pay dirt being banded to the mill at a comparatively small cost.

J. F. Wright is building an ore house on the Jo Dandy, near Cripple Creek, preparatory to doubling his shipping output.—J. Whiting has charge of the work on the new lease of the Constantine, near Cripple Creek.

Sinking has been resumed at the Fortuna mine, Cripple Creek, preparatory to developing the property.

An electric hoist has been put on the Mary Cushen mine at Victor by Lessee Muelhausen.—J. Crawford has charge of unwatering the Sunset-Eclipse, on Battle and Squaw mountains, Cripple Creek. Ore will be taken out from the 350-foot level and sinking will be continued from the 500-foot level.—L. G. Henry is taking out good ore from his lease on the Peggy mine, on Gold Hill, Cripple Creek.—The Gold Sovereign Co. at Cripple Creek is sinking its shaft another 100 feet, which, when completed, will give it a total depth of 800 feet from surface.—Briggs and associates, who were operating under lease the south end of the Dante mine, have put a second shift to work driving the face of the Trail tunnel, which is nearly 100 feet from their ground. By driving this tunnel 100 feet ahead it will permit them to work their ground at a good depth, which will be much cheaper than sinking the shaft to gain the depth.

IDAHO.

Idaho County.

The Mercantile Finance Co. of Chicago have had twenty men working the Moose Creek placers in the Newsome mining district, on the road from Elk City to Stites, since Feb. 15. This property consists of 300 acres on the banks of the south fork of the Clearwater river, the more important gravel deposits being the remaining portions of sub-glacial river channels. C. H. Parsons of Newsome is manager.

In the Four Mile district, the Acacia B. M. & M. Co., owned by P. H. Leach and F. Ritchet of Grangeville, and near the Hogan properties, have done extensive development this winter. It is free milling ore.—Wm. Hogan of Elk City will have the mill working by April 15. A cyanide plant has been put in.

Owyhee County.

F. Barnes, superintendent of the B. N. & O. and Idaho Northern railways, and E. Matheson of Murphy, have located a deposit of tripoli 1 mile from Murphy. It is 85% silica and 15% lime. It is reported that Superintendent Orford of the De Lamar mine at De Lamar will work the mine from the lower tunnel.

Shoshone County.

J. H. Heward & Co. of Mullan have been working the upper level of the Snowstorm mine for nine months and paid the company in royalties on the ore shipped \$25,121.80, representing 15% of the net smelter returns on the ore, \$167,478.66.—As soon as the snow will allow, the Washington Light & Power Co. will extend its wires from Burke to the Oom Paul mine to furnish power for the electric hoist, which is to be built on that property. The Oom Paul management did intend to put in an electric pump, but this plan has been abandoned for the present, as the water in the shaft can be handled by hauling to a depth of 150 feet.—E. P. Spaulding, manager of the Monarch M. Co. at Murray, states that the new concentrator works satisfactorily. The bins are full of ore and the amount exposed in the mine assures a long and steady run. Water power is used to run the mill, but an auxiliary steam plant will be put in this summer.

MISSOURI.

Jasper County.

E. Boyd of Carterville will build a 100-ton mill for the Trossac M. Co. at Alha.—The Batavia mill, south of Carterville, has been started.—The Quaker mill at Chitwood is running full time and making ten tons of ore per shift.—G. W. Landreth and others are sinking a shaft on a lease south of Chitwood. They are down 160 feet.

MONTANA.

Gallatin County.

At a depth of 2300 feet an 11-foot vein of coal has been struck in the properties of the Amalgamated Copper Co., at Storrs. The Amalgamated Co. is the largest consumer of coal in the State, and the finding of such a large vein will mean a saving. As a result of the action of the railroads in making a proportionate rate, dependent upon the grade of the ore, the East Helena smelter is receiving vast quantities for treatment. The Florence mine at Neihart has contracted for the delivery of 10,000 tons of low-grade ores that could not have been handled except for the reduced freight rates.

Jefferson County.

The Red Bird M. Co. will start work on the Reliance mine in High Ore gulch, near Basin.—The Leadville M. Co. have decided to build a concentrator and smelter and to develop their mines at the head of Cottonwood gulch, near Basin. J. C. McFadden of Butte is manager.



## Lewis and Clark County.

The Whitlatch-Union mine, 4 miles south of Helena, is shipping ore regularly to East Helena. A new shaft has been sunk to a depth greater than the old workings and it is from the new ore bodies recently discovered that the shipments are being made.—The Helena mine, 2 miles west of Helena, is producing galena ore which runs 40% lead and good values in silver. On the Luby claim, which adjoins the Helena, a 4-foot vein of similar ore has been found. A 5-foot galena vein has been struck in the property of the South Bend M. Co., in the Ontario district.

## Madison County.

The shaft of the Green-Campbell M. Co., near Silver Star, is down over 400 feet. They plan to build a small stamp mill this season.—The Strawberry mine, near Pony, is to be started up.

C. Estes has leased the B. W. & G. mill in Nugget gulch, near Sheridan, to treat the ore from the Mollie Gibson.—At Brandon, a larger hoist is being put on the Toledo mine.

## Missoula County.

The Tarbox M. Co.'s group of claims, 3 miles north of Saltese, on Packer creek, is to be equipped with a 50-ton concentrator. Richard Daxon is president of the company.

## Silver Bow County.

The work of sinking the shaft of the Raven mine in Centerville, 5 miles from Butte, from the 600 to the 700-foot level, has been completed. A station is being cut and timbers put in. The company has bought a large engine that will enable them to sink 1700 feet. Since the work of sinking the shaft was commenced, an excellent streak of ore has been uncovered on the 600-foot level that promises to develop well. H. Tonkin has charge of the work.

## NEVADA.

The Sundry Civil Appropriation Act, approved by President Roosevelt on March 3, provides that out of \$400,000 for surveys and resurveys of public lands, there may be expended for surveys in the mining regions of Nevada situated south of the first Standard parallel north of the Mount Diablo base line not to exceed \$25,000. It is the intention of Surveyor-General Kyle to let contracts to deputy surveyors for the survey and subdivision of the townships embracing the chief mining districts of Nye, Esmeralda and Lincoln counties to the full extent of the appropriation. The Act also provides \$15,000 for the completion of the public building at Reno.

## Esmeralda County.

(Special Correspondence).—The New Western Reduction Co. sampler and custom mill at Goldfield is ready for the machinery and may be running within thirty days. The full capacity of the sampler—100 tons—has been arranged for by local shippers and the 10-stamp mill is to be increased to twenty stamps. The Goldfield mines are steadily continuing in their output and appear to be proven to a depth of 300 feet, showing up strong values in sulphides and tellurides.

Goldfield, March 20.

A new strike of high-grade ore has been made by S. McGibbon of Goldfield for the Butte Goldfield M. & R. Co., 12 miles south of Thorpe's mill.—The Haseltine group, at Bullfrog, has been sold to W. A. Sherman, J. P. Loftus and J. R. Davis, who will develop the property under the direction of N. P. Reinhard.

## Lincoln County.

G. C. Fetterman of Caliente has sold the control of the Caliente G. M. Co. properties at Caliente to D. R. Kilbourne, C. H. Kilbourne and J. J. Elwood of California and G. A. Paxman of Silver City, N. M.—It is reported that F. O. Wilkinson, superintendent of the Green Monster mines in the Yellow Pine district, in western Nevada, and W. J. Smith have located oil wells near Caliente.

## Nye County.

Work on the Paymaster mine at Lone Mountain has been resumed with W. Coulter as superintendent. —Manager F. A. Keith of the Tonopah M. Co. will put in a steam power plant, with an electrical transmission line, at the company's wells. These wells, in which an abundance of water has been developed, are 15 miles northwest of Tonopah, on the Tonopah railroad. The plant will consist of three McIntyre & Seymour engines and four B. & W. hoilers. The engines will have a total capacity of 1005 H. P., and there will be a sub-station on the Mizpah ground for the distribution of power to the company's mines. There will also be an electric motor to operate the compressors, ore crushers, sampling works and machine shops. The wire for the electrical transmission will carry 22,000 volts. Work on the plant will be commenced at once. The new ore bins being built by the company are nearing completion and a spur from the railroad is now being placed alongside of them.—W. Watt of Tonopah has uncovered a 4-foot ledge of copper and gold ore 5 miles northeast of Coaldale.

## Washoe County.

Reno reports that the freight embargo has been raised on all goods consigned to the mining camps in the southern portion of Nevada, and every department of the Virginia & Truckee, Carson & Colorado & Tonopah railroads are working to full capacity.

## OREGON.

## Baker County.

Superintendent Hansen of the South Pole mine on the head of Rock creek, near Baker City, says that he will begin shipping to the Sumpter smelter as soon as the roads are passable. The mill will be operated on sorted ore.

President F. P. Hays of the United Elkhorn Co., owning the Baisley-Elkhorn mine, near Baker City, says that deep sinking is to be started. The Baisley-Elkhorn is opened by an adit system above the level of the mill, and a shaft sunk 300 feet below this tunnel.

A new pumping plant is to be added to the I. X. L. mine, near Greenhorn, by Manager F. T. Kelly.—Bad roads are interfering with the delivery of ore to the smelter at Sumpter. The smelter bins are full of ore, and it is expected that with what is on hand and can be deliv-

ered there will be no danger of a shortage during the time roads are in the present condition.

Work at the Thornburg placers, operated by W. L. Vinson of Baker City, on the north fork of the John Day river, is being pushed. The tunnel through which water is to be carried to the placer ground has been completed and the pipes to connect with the flume are being laid preparatory to hydraulicking.

## Douglas County.

G. W. Lloyd, president of the Crystal Con. Co., near Bohemia, says the Crystal Co. has enough water for the summer. The new milling plant will be started this spring.

It is expected that the wagon road will be finished this spring from Oakland to the Bohemia district.—W. W. Shane has charge of development work on the Pittsburg group at Bohemia.—The Frisco Con. Co. of Bohemia is trying to save zinc and lead values occurring with the gold in their ores. Concentrators will probably be used.

## Harney County.

Production of borax at Lake Alvord, which is in the basin of the Dunder and Blitzen, near Burns, has become a permanent industry. California operators have developed the reduction work until they have a large tonnage, which is hauled 160 miles to Winnemucca, Nev., and thence taken by rail to San Francisco. The interior lakes of Harney and Malheur offer a large tonnage of saline products, and assurance is that extensive salt and borax works will be established in the region. At Abbot lake, near Paisley, Lake county, tests have been made which prove the worth of the waters for both borax and salt. Much of the land around this impregnated body of water is owned by the Pacific Live Stock Co., who have interested California men in reduction of both salt and borax, with success so far as the process was concerned, but the haul of more than 200 miles over bad roads proved too much of a handicap. Experimental work has also been done at Summer lake, Lake county. There work commenced on a dike, which was intended to confine the saline waters at the head of the lake in flood season, until the summer sun evaporated the water, when the salt and associated mineral would be scraped up and refined. Tests of the water were satisfactory, but the isolation of the district was too much. Numerous other lakes exist in the great interior country of Oregon, where important operations may develop when railway transportation gives a market for the product.

## Jackson County.

The 50-foot shaft of the Nellie Wright, near Goldhill, is to be sunk another 100 feet and new machinery put in by Manager Wetherel.

## Josephine County.

The Brantner placer mine, owned by Mansfield Bros. of Grants Pass, is shut down for this season, owing to the continued shortage of water. This mine is on the west side of Applegate river, 3 miles above Applegate postoffice, and water is had from Keeler and Chapman creeks.

A gold find has been made in Gold Ridge camp, the new district on Sucker creek above Holland, southern Josephine county. A number of the claims have been operated, the richness of the quartz showing good returns by the crude light mill, mortar or sluice method. On the White Swan a 1-stamp mill has been improvised. Near the White Swan, the Koepf claim is being worked with good profit by hand. A 20-foot shaft on the Little Gem claim uncovers a 4-foot ledge of good quartz. J. Barnett will develop it.

Mining at Eureka is contingent on the success of navigation of Snake river, at least until there is improved transportation to the district, says the Oregon Journal. Senator W. B. Heyburn's success in having an appropriation of \$25,000 made to improve the river between Lewiston and Eureka will result in clearing the channel over the worst rapids. Nothing definite has been received in the upper camps as to the time when Major Langfitt will be able to get the Wallowa dredge at this work. At the Eureka property fire partly destroyed the electric machinery. The management took the power drills out of the tunnel and put in single-jack shifts. The power plant will be rebuilt and new machine drills put in.—J. A. Hillicker, manager of the Western Union property, near Eureka, is building a road to the group and may put in a development plant this season.

At Grants Pass on March 20, B. Savage of the Alameda mine defeated Waters of Sumpter in a drilling contest of fifteen minutes straightaway, 29½ inches against 26 inches. Savage on Saturday drilled 36½ inches in fifteen minutes, but Waters did not drill on account of the rock splitting, and a return match was ordered to be drilled. Lockwood of Alameda turned for Savage and Seligo of the Granite Hill mine for Waters.

## Lane County.

Manager W. B. Dennis of the Black Butte quicksilver mine, near Cottage Grove, has his new experimental furnace completed.

## SOUTH DAKOTA.

## Lawrence County.

At the Hidden Fortune, near Deadwood, ore has been struck on the 200-foot level of the Bingham shaft by Manager T. J. Steele.

## Pennington County.

President A. R. Arundale, of the Gopher M. Co. is moving the Sunnyside mill to the Gopher property at Hill City to a site selected by Consulting Engineer A. H. Elltman of Hill City. The management may add five stamps.

## UTAH.

## Juab County.

The ore shipments from the Tintic mines for week ending March 18 were: Centennial-Eureka 91, Bullion-Beck 6, Gemini 15, Ajax 3, Carisa 1, Grand Central 7, Mammoth 13, Lower Mammoth 1, Victor 3, Marlow and Baxter 1, May Day 9, Yankee Con. 9, Uncle Sam Con. 3, Eagle & Blue Bell 7, Swansea 2; total, 171 carloads.

At the Centennial-Eureka mine, at Eureka, 300 men are working. In order to handle the increased tonnage another shift has been employed on the tramway which

is used to convey the ore to the two railroads. New ore bodies are being opened up in the properties on the lower levels, and it is the intention to sink the 2100 shaft to a greater depth.—The McKinley M. Co.'s tunnel is in 116 feet, and from the report of Superintendent E. Levin of Eureka it is expected that it will soon tap the vein towards which it is directed.—The shaft of the Victoria M. Co., in North Tintic, is to be sunk another 100 feet by R. S. Robertson, the superintendent.—The Rio Grande Western Railway will build a spur to the property of the Eagle & Blue Bell M. Co. near Eureka. The company will build a large ore house so as to handle the output of the mine.—West Tintic is to have a custom mill, according to C. W. Jones, superintendent of the Bonanza property. He has secured an option on some ground in the west end, and the mill will handle the product of the different properties.

## Salt Lake County.

The Bingham Con. Co. has 300 men at work at the Dalton and Lark group. The Mascot tunnel is almost under the Dalton and Lark workings, being in nearly 8000 feet. A new electric locomotive has been put in the tunnel. The compressed air plant is furnishing air to seventeen machine drills and seven hoists.

The Fortuna Co. at Bingham is working forty-two men, under the direction of Superintendent J. Start. In the Freedom tunnel connection has been made with the Portland incline, which gives good air. The Mayflower tunnel has been cleaned out, and will be further explored and developed.

G. R. Bothwell and R. E. McConaughy have resumed work at the Congor mines at Bingham.

Chas. M. McNeill, president, and Spencer Penrose, secretary and treasurer of the Utah Copper Co., are at Bingham to decide upon the erection of a new plant, also its capacity and location. The company has 100 acres on both sides of Bingham Canyon, formerly owned by the De Lamar-Wall M. & S. Co., 320 acres bought from the West Mountain Placer Co. and a 320-acre mill-site near Garfield Beach, Saltair, Great Salt Lake. The Bingham Canyon property is developed by tunnels and has been extensively prospected with diamond drills. The country rock is a soft friable porphyry, the ore being disseminated chalcopryrite said to average 2.3% copper, ½ ounce silver and .03 ounce gold per ton. The company's present plant below Bingham is reducing and concentrating 800 tons a day.

## Sevier County.

The Copper Butte M. Co. of Richfield has contracted with W. J. Shelton for an additional 100 feet of opening in the Shelton No. 2 tunnel. This tunnel is in 100 feet.—It is reported that the Perdue-Surprise Co. will resume work at Richfield.

## Summit County.

In the annual report of the Daly West Co., at Park City, F. W. Sherman, the mill superintendent, reports that the basis of concentration was 5.98 tons into 1. The assay value of the ore milled was 5.85% lead and 14.5 ounces in silver. The assay value of the tailings was fourteen one-hundredths of 1% lead and 4.1 ounces silver. Thus the theoretical saving was 98% of the lead and 71.7% of the silver, while the actual saving, based on the concentrate sold, was 99.3% of the lead and 70.5% of the silver. While the plant can save the lead values almost to an entirety, the recovery of the silver still presents a problem needing further solution. The tailings plant, which has been in operation since the first of last May, has produced 1680 tons of dry concentrates. There is no question that a further treatment of ore through an additional plant can be made to pay high profits. Plans for such a plant have been prepared and await instructions from the directors. As the different ore bodies are worked nearer to the surface, more chloride of silver is encountered; also the Daly vein, in the eastern portion of the mine, below the 1200 level, yields ore low in lead and high in silver values. These ores require a much finer crushing, and even the silver values are more difficult of recovery than the values in ores treated in years past. Manager Ernest Bamberger says the mine produced 58,268 tons of ore during 1904, from which were received \$1,804,672.83. There were 23,355 tons of crude ore extracted, which averaged \$31.32 to the ton; 14,440 tons of crude ore from the Quincy mine, averaging \$21.16 to the ton; 15,207 tons of concentrates were produced from the mill, averaging \$39.83 to the ton, while 267 tons of mill crude sold for \$30.58 per ton. From the foregoing were obtained 2,023,005 pounds of copper, 25,651,444 pounds of lead, 2376.36 ounces of gold, 3,064,224 ounces of silver and 13,025,408 pounds of zinc.

## Tooele County.

Superintendent T. W. Galliger of the Stockton Gold M. & M. Co. of Stockton states that the mine will start shipping from the new ore shoot on the 700-foot level. The mill has been running ten hours per day.

## Utah County.

The High Ball M. & M. Co. has been formed to work the High Ball claims in Rock canyon, Utah county, by J. E. Armistead, president, L. L. Bean, vice-president, and W. A. Johnson, secretary and treasurer. The company's office is in Provo.—The Mariot M. & M. Co. has been formed to work the Mariot. J. E. Booth is president.

## WASHINGTON.

In the report of C. F. Owen, State Inspector of Coal Mines for 1903-04, the coal production of Washington was 3,190,477 tons. Pierce county reported 47,916 tons of coke. Coal at the mine averaged \$2 per ton, coke at the oven \$5 per ton. The total value of coal and coke produced was \$6,620,534. To make this product the wage cost was \$3,982,184, the average of coal per employee per day being 2.13 tons. Coal is produced in several counties of Washington, Kittitas county producing nearly one-half of the total. There were 4876 employees, averaging wages of \$2.67 per day. One life was lost for each 127,619 tons of coal produced.

## King County.

The Apex mine, near Berlin, has been making regular ore shipments to the Ladysmith smelter on Vancouver Island, and will put in an air compressor and drills.

## Okanogan County.

The Copper World Extension M. Co., on Palmer moun-



tain, near Loomis, is preparing to do considerable development work. H. Bahr, superintendent, says the shaft is in 100 feet and will be continued 500 feet. A hoisting plant, air compressor and boiler are being put in.

J. H. Arnold of Columbus, O., has been at Chesaw in the interest of the Olenzang M. Co., of which M. A. Smalley of Chesaw is president and manager. The property is 4 miles northwest of Chesaw. A shaft has been sunk on the ledge 60 feet deep and a tunnel 200 feet long has been run. The company has purchased a whim hoist and sinking will be continued.

#### Pierce County.

W. R. Rust, vice-president and manager of the Tacoma Smelting Co., says that the Tacoma and the Everett smelters are to be consolidated, but that they will not be controlled by the American S. & R. Co. The electrolytic copper refinery at the Tacoma smelter has commenced operations.

#### Stevens County.

G. Almstrom of the Double Standard mine, on Sheep creek, near Northport, says the tunnel is in over 700 feet and will tap the ledge at depth of 250 feet.

Smelter returns from the first car of ore from the Ben Vennuo mine, containing 20½ tons, amounted to \$45.13 per ton, of which \$42.31 was in gold, the remainder in silver. The property is owned by H. W. & G. H. Sparks of Kettle Falls, and is 1½ mile from Meyers Falls station.—The Silver Queen mines, 2 miles south of Kettle Falls, are being worked by W. W. Warner of Spokane.

### FOREIGN.

#### AUSTRALIA.

From the returns available, the Australian gold production for 1904 was 4,111,462 fine ounces, or 113,213 ounces less than that of 1903. The figures from Queensland are incomplete. Western Australia produced 1,983,231 fine ounces; Victoria 765,600; Queensland 624,917; New Zealand 467,897; New South Wales 269,817; with a total of 4,111,462 fine ounces.

#### BRITISH COLUMBIA.

##### Boundary District.

The Montreal & Boston Copper Co. at Brown's Camp, 9 miles from Grand Forks, which recently bonded the Seattle mine, is making preparations to do development work. Aerial tramways are to be built at once.

T. H. Rea, general manager of the Betts & Hesperus mine, 4 miles west of Grand Forks, reports the compressor plant recently installed at the mine doing good work, and he expects that the mine will soon be shipping ore to the Granby smelter.—A steam plant has been put on the Bay mine, near Grand Forks.—Work has been discontinued at the Senator mine, near Grand Forks, by Foreman Rogers. This property was bonded to the Granby Co., and has been worked for several months, 3000 tons of ore having been shipped from the glory hole of the property. It is said the ore has given out.

The ore shipments and smelter treatments from the Boundary for the week ending March 18 were: Granby mines to Granby smelter, 12,385 tons; Mother Lode to British Columbia copper smelter, 3168 tons; Brooklyn to Montreal & Boston smelter, 2289 tons; Rawhide to Montreal & Boston smelter, 1949 tons; Mountain Rose to Montreal & Boston and British Columbia copper smelters, 132 tons; Emma to Nelson and British Columbia copper smelters, 217 tons; Oro Denoro to Granby smelter, 99 tons; total for week, 20,239 tons; total for year to date, 176,723 tons. Smelters treated ore as follows: Granby smelter, 12,243 tons; British Columbia copper smelter, 4423 tons; Montreal & Boston smelter, 4368 tons; total for week, 21,034; total for year to date, 193,881 tons.

##### Nelson District.

The Yankee Girl, the Canadian Girl and Yale fraction on Dundee mountain, 3 miles from Ymir, have been bonded for \$50,000 to C. J. Doyle of Chicago.

##### Roseland District.

The Trail smelter has torn down the last of the old Heinze gold-copper furnaces, and is putting in a new furnace, with a capacity of 350 tons a day. The old furnace had a capacity of about 150 tons a day. The smelter has now three large gold-copper furnaces, with a combined capacity of over 1000 tons daily.—The tonnage of ore shipped from the Roseland mines for the week ending March 18 was: Le Roi, 2275; Centre Star, 1440; War Eagle, 1620; Le Roi No. 2, 220; Spitzee, 240; White Bear, 125; White Bear (milled), 600. Total for week, 6250 tons, and for the year, 74,676.

The manager of the Le Roi No. 2, at Roseland, has recommended that they start sinking in the main shaft from the 900-foot level to a depth of 1450 feet. They have made a contract with the Trail smelters to reduce its ores.—The Mavis, adjoining the Bay claim, in Skylark camp, has been bonded by D. B. Morkill, J. J. Strutzel, G. L. McNicol, W. X. McDonald, C. M. Campbell and J. A. Hanna of Phoenix for \$15,000.—J. C. Haas will start work on the Golconda in Deadwood.

##### Slocan District.

It is reported that the "L. H.," near Silverton, is to be developed this season.—The Rockland Copper Co., in which W. W. Sparks of Vernon and F. Watson of Spokane, Wash., are interested, will develop the Rockland, near Silverton, this spring.—N. F. McNaught of Silverton will start work on the Little Daisy.—The lead ores of the Galena, near Silverton, are being developed by a company in which C. H. Hand of Butte, Mont., and A. W. McCune of Salt Lake City, Utah, are interested.—Nicholson & Galloway of Silverton are working the Noonday under lease.—The Hewitt mine, near Silverton, is shipping steadily and developing ore reserves. M. S. Davy has charge. Thirty men are employed.—The Lorna Doone is being worked from the Hewitt tunnels. M. S. Davy has a bond and lease on this, as well as the Emily Edith, where he is working ten men.—G. Wyland of New Denver has eight men at work on the Standard-Surprise group.—It is re-

ported that the Wakefield mine, 4 miles above Silverton, on Four-mile creek, is to be started.—D. Brandon is working the Mountain Broomer under lease.—The Fisher Maiden, 7 miles above Silverton, is being worked by C. Twitchell of Spokane, Wash.

### CANADA.

#### Ontario.

According to a consular report, a vein of silver has been discovered on lands north of Massey and the Bruce mines, near North bay. Four carloads of ore shipped to New Jersey netted \$60,000.

#### INDIA.

The report of the Chief Inspector of Mines in Mysore, W. F. Smeth, for 1903-4 shows that the gold value during 1903 was £2,288,429 for the fine gold. During 1903 five mines (Champion Reef, Mysore, Oorogum, Nundydroog and Balaghat), producing 98% of the total output, paid dividends: three. Coromandel, Mysore West and Mysore Wynaad, produced £43,927 worth of hullion; six. Road Block, Oriental Gold, Kempinkote, Kadur-Mysore, Gold Fields of Mysore and Nine Reefs, worked without production, and the Mysore Nagar closed down. Active development has been carried out at the Bellara Block and in the East Betarayawami and Bodimardi further prospecting is contemplated. On an ore carrying very little base material, the following are some of the cost items for 1903: Value per short ton milled, 88.25s.; total cost per short ton milled, 28.205s.; mining cost per short ton milled, 20.25s.; milling cost per short ton milled, 3.77s.; cyanide cost per short ton milled, 1.77s. Coal costs the mines 21s. a ton—while most of the electrical power used was charged for at £29 per horse power per annum, though this figure is to be reduced this year to £18. The average weight of the stamps in the six chief mines of the field is 1037 pounds, giving a duty of 3.63 tons a day, against the Transvaal figure of 4.8 tons for a somewhat heavier average head. With the exception of preliminary breaking in the rock crushers, the stamps do the whole of the crushing, the ore being amalgamated in the mortar boxes and the pulp passed through 34.7 mesh. This is the finest crushing it receives. The pulp is then stacked in heaps for some months to weather before cyaniding, in order to obtain further comminution of the particles by atmospheric action. Cyaniding yields an average extraction of 61½%, with the result that the residues contain from 4s. to 5s. of gold. Spitzkasten are being experimented with; secondary rock breakers are being tried at Ooregum, a tail rope is to be tried in the new Oakley shaft at the same mine, and the continuation of the shaft on the incline is in the foot wall instead of in the lode itself. The total labor force was 27,355, divided as follows: Whites, 239 below ground, 290 above; Eurasians, 99 below ground, 303 above; natives, 17,237 below ground, 9729 above. The number of fatalities per 1000 below ground was 3.29, and above 1.13.

### MEXICO.

#### Chihuahua.

The Parral Miner reports that A. de Lantreppe of Parral has taken charge of the Buen Viento mine, north of Palmilla hill, the contractors, Weisel & Koch of Parral, having finished the 300-foot two-compartment shaft. Ore was struck at a depth of 115 feet in a crosscut driven towards the vein, which proved to have a width of 16 feet. The first shipments were made in December last averaging 800 to 900 grams silver. Another crosscut has been started, which is to cut another vein. On the El Faro claim Weisel & Koch have sunk the three-compartment shaft 160 feet, and will be continued to cut the San Patricio vein at a depth of 300 feet. When finished they will put in a 100 H. P. gas hoist and producer. The three-compartment shaft being sunk on the Gran Bretano by the same firm to cut the Refugio vein is down 40 feet, and will be equipped with a 50 H. P. gas engine. These claims belong to the Buen Viento Co. of New York, who have also bought the San Rafael and San Cristobal properties.

The Parral Deep Levels Co. is developing the Florentina property under the management of J. F. Flynn of Parral.—It is reported that the Hidalgo M. Co. will work most of their mines in the Parral district this year.—The United States M. Co., under the management of J. W. Marshall, is shipping to the Parral Milling Co.

#### Durango.

The Guadalupe mines at Inde, belonging to D. G. Benton, have been examined by H. J. Jessop. The Guadalupe, Fundicion Plomoso, Potrillo, La Luz, Raton and Marias mines are all being worked at Inde.

J. Rawlings, manager of the Socaban mines for Hearst & Haggin at Tayolita, is to build a 40-stamp mill at the mines. The present mill is of five stamps.

#### Guanajuato.

The cyanide plant of the Guanajuato Con. M. & M. Co. at Guanajuato is treating ore from the Sirena y Anexas. The silver value is greater than the gold. Manager M. E. McDonald has done considerable development work in the mine.

#### Hidalgo.

The Argentine y Anexas M. Co., City of Mexico, proposes to build a 20-stamp mill and concentrator at their mine at El Chico, Pachuca.

#### Jalisco.

J. R. Bickerdike of Guadalajara, one of the owners of the Rosa Amarilla mines, reports that the company has a concession for an electric line from the mines to the Pacific port of Navidad, and plan to extend the road to Autlan.—N. W. Kinross, manager of the Chatterton M. Co. operating at Tapalpa, states that 50 men are developing the veins on the property. The mill and concentrators will be started.—The Jalisco Times reports that H. H. Sawyer of Philadelphia has bought the mines of the Bautista M. Co. in Bautista, 75 miles south of Ameca. B. McLellan has been managing the mines. J. H. Howard has been secretary. Steam hoists and steam pumps have been put in and the high grade ore mined has been shipped to the smelters. It is the intention of

Sawyer and associates to build reduction works and treat the ore at the mines.—F. C. Helm has bought the Agua Blanca copper mine, near Santa Rosalia, from D. Furness of Guadalajara and B. M. Esler.

#### Michoacan.

It is reported that the copper mines at Inguaran are to be worked by the Paris Rothschilds. M. Rohellar is at the property to determine plans for operations.

#### Sonora.

(Special Correspondence).—The production of copper by the Cananea Copper Co., at La Cananea, for February was over 5,000,000 pounds, an average of ninety tons per day. So much rain has fallen that the water has seeped through the ground to the workings, greatly hampering the mining. The ore in the chutes is so soggy it will not run and has to be loaded into the cars by hydraulic pressure. Slides have occurred on the railroad and for several days Puertocito could not be reached, delaying the delivery of lime, wood and clay for the converter linings, and greatly inconveniencing operations at the smelter.

La Cananea, March 17.

### RHODESIA.

Superintendent T. G. Davey of the Rhodesia Broken Hill property, in northeast Rhodesia, says that the mine is on a high plateau, at an altitude of 4000 feet. The metals are lead and zinc, which occur as carbonates, silicates, oxides, and a small percentage of sulphides, distributed over a considerable area, and conspicuously so in a number of large outcrops or kopjes, of which these minerals constitute the predominant proportions.

## Commercial Paragraphs.

R. J. CORY, 244 Equitable Building, Denver, Colo., has an order for a silver-lead smelting plant to be shipped to the Los Arkos S. & M. Co., Toluca, Mexico.

E. H. BANGS has resigned as engineer and salesman of the Byron Jackson Machine Works of San Francisco, to take a similar position with the United Iron Works, 32 Fremont St., San Francisco, Cal.

CARY & FIELDING, 1711 Tremont St., Denver, Colo., report the sale of two Cross-compound steam and air Rand compressors, 10 drill each, for shipment into Colorado; they have also an order for addition to cyanide plant of Dorcas mill, Florence, Colo. They report good sale on Cameron pumps, of which they have the Colorado agency.

THE Sullivan Machinery Co. of Chicago announces the establishment of a new branch office in Salt Lake City, Utah, room 128 Keith building, John C. Taylor, formerly of the Denver office, manager. The new office will carry a full line of Sullivan straight line air compressors and rock drills, with mountings, equipment and duplicate parts in stock.

THE Risdon Iron Works of San Francisco, Cal., has secured the right to use the pump patents of Sulzer Bros., builders of the Sulzer centrifugal pump exhibited at the Paris Exposition of 1900. They have incorporated these ideas in the design of a centrifugal pump to be known as the "Risdon-Sulzer," and have finished a careful series of tests with one of their standard belt type, two-stage machines. Invitations were recently issued to pump builders and several leading business men, interested in pumping machinery, to visit the works and see this pump in operation and under test. The Risdon Iron Works reports that on that occasion the pump showed high efficiency: "During the test the pump delivered from 450 to 725 gallons of water per minute, to heads ranging from 100 feet to 260 feet, with an efficiency ranging from 72½% to 79%. No allowance for work lost by belt and shaft friction was made, although this is generally taken into account in testing centrifugal pumps. It is safe to say that this would account for at least 2½%. In other words, had the pump been direct connected to an electric motor, the test would have shown 75% to 80% efficiency, a most unusual result for this class of pumps."

## Books Received.

"Biennial Report of the Missouri State Geologist," by E. R. Buckley, gives an account of the objects of the Missouri Bureau of Geology and Mines, a review of what it has accomplished, and a brief account of the State's mineral resources.

Denny's prospectors' map of Nevada mining districts and part of southeastern California shows wagon roads, trails, railroads, watering places, etc., and is compiled from late authentic data. It will be sent postpaid anywhere on receipt of 75 cents at this office.

## Trade Treatises.

Catalogue No. 15 of the Union Steam Pump Co. of Battle Creek, Mich., describes the Burnham steam pump. In addition it contains much valuable information on capacities of pumping plants.

The Hardsocg Wonder Drill Co. of Ottumwa, Iowa, and 1744 Broadway, Denver, Colo., send a well illustrated booklet describing the Little Wonder air hammer rock drill and the Herron & Bury compressors.

Gold milling machinery of the latest types is attrac-



tively set forth in Catalogue No. 16 of the Joshua Hendy Machine Works of San Francisco, Cal. The illustrations of crushing and milling machinery are especially fine.

The Wellman-Seaver-Morgan Co. of Cleveland, Ohio, issue a neat booklet describing and illustrating the Dewhurst slag ladles and cars.

## Personal.

A. B. CANFIELD of Bakersfield, Cal., is in San Francisco, Cal.

L. S. SHOENFELD is manager Boulder Reduction Co., at Jamestown, Colorado.

F. J. TOUSSANT is manager La Chumata silver mine near Arizpe, Sonora, Mexico.

LEONARD SIVYER of Los Angeles, Cal., is at Prescott, Ariz., on professional business.

D. C. JACKLING has been made manager Bingham Central Co. at Bingham, Utah.

THOMAS FIELDING of the firm of Cary & Fielding, Denver, Colo., is in Chicago, Ill.

J. T. BOGAN has returned to Park City, Summit county, Colo., from Stockton, Utah.

B. C. RIBLET, manufacturer of the Riblet tramway, Spokane, Wash., is in St. Louis, Mo.

A. M. LIGHT has charge of work of the Standard Group Marble Co. near Bossburg, Wash.

ARTHUR W. JENKS, M. E., of Salt Lake City, Utah, is in Nevada examining mining properties.

CHAS. CHAMPLIN has returned to his dredging property on Footh creek, near Gold Hill, Oregon.

N. TREWEEK, SR. of Lead, S. D., has been appointed State Inspector of Mines to succeed T. Gregory.

C. H. MUNRO is superintendent Oroville Gold Dredging & Exploration Co., Oroville, Butte county, Cal.

F. R. BALDWIN, superintendent Maitland property, has returned to Deadwood, S. D., from Chicago, Ill.

JOHN DEE is manager Cacomia M. & S. Co.'s additional mines and smelter, near Autlan, Jalisco, Mex.

T. T. HARDING is manager Gladstone M. Co., owning the Macedonian mines, 12 miles northeast of Nogales, Ariz.

WM. THOMPSON, consulting engineer for the Velvet-Portland M. Co., has returned to Rossland, B. C., from Ocampo, Mexico.

J. L. BRYSON of San Francisco, Cal., has gone to Goldfield, Nev., to take superintendency of the Goldfield-Badger property.

C. J. STONE (with Dickman, Mackenzie and Potter, 1120 Rookery), Chicago, Ill., is inspecting mining properties in Colorado.

J. C. GOODIER is manager and T. S. Davidson is superintendent Abundance M. & M. Co. at Breckenridge, Summit county, Colo.

TODD C. WOODWORTH of the New Western Reduction Co., Goldfield, Nevada, has returned to that busy camp after an Eastern visit.

GEO. L. HOLMES has removed from Folsom, Cal., to Oakland, Cal., and contemplates gold dredger mining practice in San Francisco, Cal.

ED. HOFFMAN, formerly superintendent Silver Shield at Bingham, Utah, has been appointed superintendent Carisa M. Co. at Eureka, Utah.

J. B. JENSON has resigned as manager Pioneer Smelting Co. at Sandy, Salt Lake county, Utah. A. J. Cushing has resigned as superintendent.

R. P. AKINS, representing the Colorado Iron Works Co., Denver, Colo., has returned there from an extended trip through Nevada, California and Arizona.

E. J. WILSON, formerly superintendent Le Roi smelter at Northport, Wash., has been appointed superintendent of the Yampa smelter at Bingham, Utah.

W. C. MILLER of Wallace, Idaho, succeeds E. J. Roberts as general manager Federal M. & S. Co. The latter resigns to become chief executive officer Spokane & International Ry. Co.

J. H. FENNESSY, president, and A. H. Seep, vice-president of the Mine & Smelter Supply Co., Denver, Colo., have gone on a three months trip to Havana, Vera Cruz and City of Mexico.

H. E. WEST, late superintendent La Leonessa mine, Matagalpa, Nicaragua, C. A., has accepted a position on the engineering staff of R. M. Raymond, general manager El Oro mine, Mexico.

CHAS. H. MCMAHAN has resigned the general superintendency of the Montezuma Lead Co., Santa Barbara, Chihuahua, Mexico, and removed to El Paso, Texas, where he will engage in engineering practice.

## Obituary.

C. V. LOGAN of Denver, Colo., was shot and killed in an Indian hut at Lida, 20 miles south of Goldfield, Nev., on March 19.

MEYER GUGGENHEIM, one of the most eminent and conservative financiers of the United States, died at Palm Beach, Fla., March 16, of pneumonia. He was the creator and builder of the firm of Guggenheim's Sons of

New York, well known in the smelting business and mining world.

JOHN G. RHODIN died March 21 at Park City, Utah, where he had charge of the American Flag mine. Rhodin was engaged in mining for a third of a century and had worked in California and Oregon mines a great many years, being at one time superintendent of the Virtue mine at Baker City, Or.

## Latest Market Reports.

SAN FRANCISCO, March 24, 1905.

### METALS

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 58½c, refined (1000 fine); San Francisco, 58½c; Mexican dollars, 48c, San Francisco; 48½c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37½; Electrolytic, 1 to 3 casks, \$15.37½; Casting, 1 to 3 casks, \$14.87½. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18½c. London: £67 17s 6d spot per ton.

The copper market remains firm and practically unchanged. The total stock on hand reported March 1 was 12,000 tons with a visible supply due to shipments afloat from Chile (3571 tons) and Australia, (1550 tons), a total of 17,125 tons. An English authority says of the market: "The present level of prices for copper appears to be now firmly established and a further advance in price is very probable in view of the increased consumption in the United States, the large shipments to China, and the activity in the shipbuilding, engineering and electrical trades, both in England and on the Continent, with no immediate prospect of any material increase in the supplies."

Following are the figures of German consumption of foreign copper for the month of January, 1905, compared with the same period of time for 1904-1903:

	1905. Tons.	1904. Tons.	1903. Tons.
Imports.....	7,500	9,391	6,828
Exports.....	925	676	795
Consumption.....	6,574	8,715	6,034

Out of the above, 6169 tons were imported from the United States.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 8s 8d per long ton.

SPELT.—New York, \$6.15; St. Louis, \$6.15; London, £23 7s 7d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.70@29.90; San Francisco, ton lots, 31c; 500 lbs., 31½c; 200 lbs., 32c; less, 33c; bar tin, 3½c, 35@37½c. London, £136 5s.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 19.75c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, 50c; dust, 3½c, 10c; sulphate, 3½c, 10c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer: hillets, Pittsburgh, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 cts, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. O. H. San Francisco: No. 1, 70% nitro-

glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½@—; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B. 1½@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, boiled, hbl., 60c; cs., 65c; raw, hbl., 58c; cs., 63c; Lucol oil, boiled, hbl., 51c; cs., 56c; raw, hbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As, tral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c, Elaine, 25c; Water White, in hulk, 12½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, hulk, 16c, do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in hulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, 3½c, 80c.

PHOSPHORUS.—American, 3½c, 70c.

SODIUM.—Metal, 3½c, 50c.

BISMUTH.—Subnitrate, 3½c, \$2.10.

URANIUM.—Oxide, 3½c, \$3.50.

MERCURY.—Bichloride, 3½c, 77c.

TUNGSTEN.—Best, 3½c, \$1.25.

SILVER.—Chloride, 3½c, 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, 3½c, 7c; less than 500 lbs., 7½c.

MANGANESE.—Per lb., \$2.75.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads 1000, f. o. h., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, 3½ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. h., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MARCH 14, 1905.

781,728.—TABLE.—S. Astalos, Silverdale, Wash.  
781,976.—STEAM BOILER.—G. H. Blowers, San Francisco.  
784,918.—GARMENT.—M. Buesick, Phoenix, Ariz.  
784,984.—TOOL.—W. L. Carson, Seattle, Wash.  
785,035.—LOCOMOTIVE.—P. F. Dundon, San Francisco.  
784,995.—NEEDLE.—T. C. Edwards, Salinas, Cal.  
784,790.—BATTERY STEM GUIDE.—C. P. Hawley, Heppner, Or.  
784,676.—CARBURETER.—J. F. E. M. Hilscher, Fullerton, Cal.  
784,859.—SEWE.—M. W. Hunt, Portland, Or.  
784,665.—COMPENSER.—J. M. Keller, Los Angeles, Cal.  
784,689.—GAS BURNER.—Kistler & Symonds, Los Angeles, Cal.  
785,045.—BOOTJACK.—J. J. McDonald, Port Madison, Wash.  
784,586.—HOISTING DEVICE.—R. McGahey, Walla Walla, Wash.  
784,751.—SHOW CASE.—W. W. McKee, Tacoma, Wash.  
784,801.—CARPET CLEANER.—A. E. Moorhead, Oakland, Cal.  
784,855.—EXTRACTING ORE.—E. L. Priest, Oakland, Cal.  
784,808.—ENGINE.—C. A. Sawtelle, San Francisco.  
784,802.—FIRE FABRIC.—S. Scarles, Stockton, Cal.  
784,763.—SHAVING BRUSH.—Silverman & Vincent, San Francisco.  
781,710.—HOOK AND EYE.—G. G. Tandy, San Francisco.  
781,769.—HAMMOCK SUPPORT.—W. Vincent, San Francisco.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

SANITARY SHAVING BRUSH.—No. 784,763. March 14, 1905. L. Silverman of San Francisco, Cal., and Wm. Vincent of Oakland, Cal. The object of this invention is to provide a simple, practical sanitary brush which may be taken apart after each period of use, the bristles opened out and thoroughly cleansed and sterilized, and which permits the parts to be again easily assembled.

COMBINATION HAMMOCK AND CANOPY SUPPORT.—No. 781,769. March 14, 1905. William Vincent of Oakland, Cal. My invention relates to improvements in supporting means for hammocks, canopies, tent coverings and the like. Its object is to provide a light, collapsible and adjustable support of this character which can be set up quickly and made into a rigid structure or be knocked down and folded into a small compass convenient for carrying and shipment. It consists in the various details of construction adapted to bring about the required result.

REVOLUBLE EXPLOSIVE ENGINE.—No. 784,808. March 14, 1905. C. A. Sawtelle, San Francisco, Cal. Assigned to the Sawtelle Rotary Motor Co. of San Francisco, Cal., a corporation of California. This invention consists essentially of a plurality of cylinders mounted radially about a crank shaft and having the connecting rods of each extending from their pistons to a crank sufficiently distant from the crank shaft to insure the reciprocation of each piston in its cylinder as the cylinders are revolved around the shaft. The cylinders are connected with a central chamber forming a crank casing which is turnable upon the shaft and which casing has sleeves extending to both sides, through which the shaft passes, one of said sleeves carrying a gear engaging a similar gear and adapted to transmit power to the power shaft. The crank shaft also carries a gear and by the disposition of these gears both the crank casing and cylinders and the shaft are revolved in opposite directions when power is applied, and the motion of each will be transmitted to a power shaft or shafts.



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## Cananea, Mexico.

The city of Cananea and its huge activities have sprung into existence "in a day," as it were. Five years ago the site of the present populous and prosperous town was merely a collection of adobe houses and rude Mexican huts. The accompanying illustrations convey some idea of the change which has taken place in this brief time. The great mines and reduction works are in the vicinity of the town. The holdings of the Cananea Copper Co. exceed 10,000 acres of land in this mineral belt, which extends southeastward into Mexico and northwestward into Arizona. The smelters are turning out millions of pounds of copper monthly, and the concern has become one of the most important copper producers in the world. The company owns a railway system connecting the most important mines with the smelters, and with the main line of railway to the northward. The town has all of the essential features of metropolitan cities of the sixth class in the United States; has numerous public buildings, handsome private residences, and other substantial improvements. The climate is fine, and there is no more healthful locality in the mines of the Southwest. The greater number of inhabitants not engaged in merchandising are directly connected in some capacity with the copper mines, reduction plant or the railway. Besides the holdings of the Cananea Co. the Copper Queen Co. of Bisbee, Ariz., has purchased a number of promising mining locations, which they are developing. There is gold and silver in the dis-



General View of the Town of Cananea, Mexico. (See Page 200).

trict, also, but the mines are chiefly valuable for copper. In the region lying to the westward of the Cananea mountains gold mines have been developed in a superficial way, but their richness has not, as yet, been of such a character as to attract much attention outside the district. Mining is carried on there in a primitive way, mostly by Mexican miners, many of whom make a livelihood by working the placers by employing various types of dry-blowing machines.

This section of Mexico is receiving an increasing amount of attention with each passing year. The copper mines of Nacozari are only a few miles distant to the southeastward, and are apparently on the same mineral belt with Bisbee and Cananea. There are also numerous other copper prospects which have been well spoken of, and the copper output from this part of Mexico gives evidence of being increased for some time to come. The ores of the district are both oxidized and sulphide. Much of the material is sent to the smelters direct from the mines, but the sulphide ores are concentrated and the concentrates sent to the smelters for further treatment.



Smelters and View of a Part of the Town, Cananea, Mexico. (See Page 200).



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## "Reforms Needed in Mining."

As a class, mining engineers are proud of their profession, and they have every reason to be, for the mining industry is the basal industry of this country, the foundation upon which all other industries are built and, through it, maintained. This does not refer particularly to the business of gold and silver mining, but also to copper, iron, coal and all of the other varied branches of the great industry of mining.

Is the imputation made elsewhere (see page 202) by a correspondent true—that mining engineers have become apathetic and have shown little progress in making a substantial advance, and that the professional mining engineers have not kept pace with practical miners during the past thirty years?

An analysis of the situation fails to show that such is the case. Rarely have mining engineers undertaken to claim credit for that which they did not inaugurate or create. Nearly all of the advance in mining science is directly attributable to mining engineers.

In the contemplation of this subject the mining engineer must not be confounded with the promoter. The latter is quite a different personage, having usually little to do with the practical business of mining. It is the business of the mining engineer to carefully consider the best interests of his company, to equip the mine with proper machinery, to exercise his judgment in this and every other direction, and to produce the very best possible economic results with the available means under existing conditions. Mine managers are not all mining engineers, but this is written in reference to mining engineers, whether managers, consulting engineers or superintendents. A mining engineer will have the books of the mine kept in such shape that he may at any time ascertain the cost of doing any particular work, whether drifting, sinking, stoping, milling or whatever it may be. He should be, and usually is, a good judge of the amount of work men in the various departments under him should reasonably perform in a day. Having determined this quantity and demonstrated it practically he must see to it that this result is obtained. If the manager does not make it his business to look after these small matters they will probably not be looked after. When the cost runs up he demands an explanation of the foreman and shift

bosses. If a satisfactory explanation is not forthcoming there may be some changes in the staff.

There are those who may criticize adversely this method of running a mine, but it is not a subject for adverse criticism. It is a method applied in business of almost every kind where working people are employed. When the men accept employment it is with the unwritten understanding, without comment or agreement, that they will give their best energies to their work. A single laggard in a gang of men will spoil the whole crew, and often the summary dismissal of this undesirable individual will work an astonishing reform in the remainder of the crew.

The mining engineer does not lack inventive genius, or initiative. He may not be an inventor, in the strict sense of the word, but he is certainly quick to perceive that a given invention can be applied to advantage in or about a mine. The steam shovel was designed originally to excavate banks of gravel. Probably nothing was further from the thought of the original inventor than putting a steam shovel several hundred feet underground to handle rock, but the mining engineer has applied it successfully to this class of work.

The charge that since the invention of the square-set system nothing of consequence or value has been done by mining engineers is without foundation. It is true that the square-set system, as invented and perfected by Phillip Deidesheimer, in the Ophir mine on the Comstock Lode, at Virginia City, Nev., in 1860, was one of the most fortunate and valuable contributions to the science of mining that the world had ever seen. It made it possible to operate mines which could not be worked previously by any known method; but within the past ten years economic conditions in some mining districts have demanded that the ore bodies be extracted at less expense, and, the square-set system being too costly, methods of stoping and filling have been introduced at some mines, where less than one-fifth the timbers required by square-set method are now used, and the ore is successfully extracted without loss of ore or injury to the workmen. Notable instances are at the Homestake mine, South Dakota (described in the MINING AND SCIENTIFIC PRESS in the issues of March 5 and 12, 1904), and at the Broken Hill mines, N. S. W. (MINING AND SCIENTIFIC PRESS, July 18-25, 1903), and D. G. Del Prat mined underground a mass of iron ore several hundred feet in width in Spain without using any timber at all. Surely these results of mining engineers' versatility and application are worthy of consideration and credit, and the very thing suggested by the correspondent has already been accomplished, but apparently without his knowledge. The mining method adopted by Gardner F. Williams in the Kimberley diamond mine is unlike any mining methods elsewhere. It is simple and inexpensive and requires no timber; but this method is due to the peculiar conditions obtaining there and can not be employed in all cases.

The suggestion that the distance between levels be reduced from 100 to 50 feet is that of one unacquainted with the additional expense required to open a level in a mine, and it is owing to this expense that in many well managed mines the levels are being cut 150 to 200 feet apart, a greater rather than a less distance.

The "three problems which must be solved," as suggested by the correspondent, viz., 1, Abolishment of timbering; 2, Reform in the system of overseeing; and, 3, Installation of reduction works in the mines, are rather amusing than otherwise. The first has practically been solved and a broader application of the idea may be looked for. In answer to the second, it may be suggested that no system of overseeing which fails to get an honest day's service from workmen can, nor should it endure. The owners look to the manager to accomplish reasonably good economic results. The manager necessarily places the situation before his foremen and shiftbosses, and it is their business to see that the men do their work properly. Men will not usually attempt to take advantage of a shift boss or foreman if they know that these under bosses are practical men who fully understand what a day's work really is. There is no doubt that there are instances where the power of the under bosses is used in a tyrannical and unjust manner, but these instances are comparatively rare. If a man is an incompetent workman or is physically

unable to perform the duties required in his position, the "boss" will quickly discover it. He usually gives a friendly warning, which failing of the desired result, the offender is given a time check and sent to the surface. The third proposition, that reduction plants be placed under ground, is so impracticable and so devoid of common sense that no argument will be advanced against it.

The charge that shift bosses are placed in the mine principally owing to their qualifications as "fighting men" is untrue, with very rare possible exceptions. When the under bosses lack knowledge and experience in their work the miners can "soldier" ad libitum and the shift boss will not be aware of it. The only way in which shift bosses and other overseers may be dispensed with is by substituting the contract system. In this case every man has every other man on the job urging him to greater endeavor instead of but one as before, for all are now interested in seeing the best work done, that the profits may be larger for all.

The suggestion that the limitations of winding by single stage was reached, and overreached, at 4000 feet, is not substantiated by facts. There are a number of vertical shafts down below 4000 feet in the world, and at least two are within a few feet of a mile in vertical depth, and the loads are lifted from the bottoms of these shafts with a single winding and with apparent ease. That 5000 feet will mark the limit of depth to successful mining with single stage winding is not apparent.

The transportation problem deserves a word in this connection. Twenty years ago nearly all underground transportation was done by men who pushed single cars loaded with ore to the stations. Here and there was found a mine where a locomotive of some sort had been introduced to replace the trammer, and the cars were hauled from some central point in trains. Now nearly all large mines have either mechanical, electric or compressed air haulage plants in successful operation. All of these improvements are the direct result of the efforts and demands of the mining engineers and not of the laboring miners. These and many other mechanical devices, as well as improvements in the system of mining, have lowered the cost of mining step by step, until we see to-day mines successfully and profitably operated which would have fallen far short of it even a decade ago. The outcome is that work is afforded thousands of miners who otherwise could not be employed. It is not a fact that an increase in the wages results in an increase in the work of the miners. Good miners will seek the camps that pay the highest wages. This is true—and it is also true that these better workmen will crowd out and replace those who are their inferiors. This is the result of the natural adjustment of the conditions. The incapable miner gains little by an increase in wages, except under certain conditions where organization dominates common sense.

As to the relation of the mining engineer to fraudulent promotions, it does not concern him particularly. No mining engineer of good reputation will lend himself to what he knows to be a swindle, and his voice raised against it would fail to reach those who would fall victims to the wiles of the wildcat promoter. Technical journals stand in the same position exactly. The people who read the leading technical and mining publications are not those who are taken in by a fraudulent mine promotion. Without doubt the worth of a single upright mining engineer is far greater than that of any number of fraudulent promoters, but the prospective victims of the latter are beyond the reach of the former.

The overcapitalization of mining corporations is the result of the operation of financial directors, and cannot be charged to mining engineers. It is impossible to tell the value of a mine without a careful and exhaustive examination, not only of the mine itself, but of all the conditions having a bearing on its benefication. Mines sometimes exceed the expectations of their promoters and return more than was anticipated.

The communication on page 202 is apparently written in ignorance or defiance of plain facts. It is intemperate in tone and its strictures are almost wholly undeserved. To further comment upon it would probably be unnecessary to those who could understand it—and useless to those who could not.



## CONCENTRATES.

**NICKEL** occurs often in association with pyrrhotite, a magnetic iron sulphide.

**METALLURGICAL TESTS** of any kind should be made in a manner as closely approximating the treatment on a commercial scale as possible.

**TOPAZ** is associated with cassiterite at a number of places, known localities being Altenberg and Zinnwald, Saxony, and Mount Bischoff, Tasmania.

Two terms of mining leases should be clearly understood and reduced to writing to avoid future possible difficulties. If the lease is for a longer term than one year, it should be written in order to avoid the "statute of frauds."

**TOURMALINES** occur in coarse-grained granite (pegmatite) dikes. All tourmalines are not transparent. Some are black and opaque. This variety is known also as jet. The colored tourmalines when transparent are valuable as gems, and for optical purposes.

No secretary has as yet been appointed for the California Miners' Association to succeed E. H. Benjamin, who was elected to the presidency of the Association last December, and who is acting secretary at present. His office is at 331 Pine street, San Francisco, Cal.

**IRON AND STEEL TOOLS, RAILS, ETC.**, left in copper mines which subsequently become filled with water, often are replaced to a greater or less extent by copper, depending on the length of time the iron or steel objects remain in contact with the copper-bearing water.

The scouring of inside plates in stamp batteries may be reduced materially by placing over the plates a grating of either cast iron or heavy wire screen. This breaks the cutting and scouring force of the pulp splash and gives the amalgam an opportunity to accumulate on the plate.

The Printer Boy gold mine on upper California gulch at Leadville was the only quartz mine of consequence in operation in that district in the early 70's. The carbonate ores had not been discovered at that time. The ore was treated in a mill at the mine. The output was about \$8000 per month.

**MINING CLAIMS** are located and held in Alaska under the Federal mining statutes. Miners in any organized district of Alaska may make rules and regulations governing the recording of notices of locations of mining claims, water rights, flumes and ditches, millsites and affidavits of labor not in conflict with the general laws of the United States.

A **TURBINE WHEEL**, 56 inches in diameter, under a 13-foot head, will require 5250 cubic feet of water per minute, (about 3500 miners' inches) and will develop about 115 H. P., the wheel making 89 revolutions per minute. There would be no advantage in placing in the penstock either a larger or smaller wheel, as the former would run more slowly and the latter would not pass so large a volume of water.

An ore feeder cannot be allowed to run without attention. It has devices to regulate the feed fast or slow. It cannot be set and kept at one position with any probability of an absolutely regular feed being maintained unless the ore coming to it is uniform in size, character and amount of moisture. The stamp tappet is supposed to drop on the feeder rod when the ore is required, but feeders require looking after by the battery men.

The legalized ton is 2240 pounds avoirdupois, as fixed by the United States Statute (sec. 2951), but the ton in general use is 2000 pounds. Ores throughout the United States are weighed by the ton of 2000 pounds, and in some districts coal, also, is weighed by this standard, though in the anthracite regions of the East, at the mines, the ton of 2240 pounds is employed, but the retail trade is carried on on the basis of 2000 pounds to the ton.

A **RECENTLY** completed survey of the United States Coast and Geodetic Survey, which has extended from the Atlantic to the Pacific oceans, in which precise leveling was the most important feature, has established a discrepancy of 0.615 foot between the two oceans, the Pacific being the higher. It is thought the discrepancy is due either to an accumulating error in leveling or to inaccuracy in making tidal observations, which can only be done by taking the mean of a large number of observations.

**MONAZITE** is the principal mineral employed in the manufacture of the white mantles used on gas lamps. It was worth \$140 to \$150 per ton in 1903. Monazite varies somewhat in color, being light yellow to honey yellow, reddish, brownish, and yellowish green. It has a resinous to vitreous luster, is brittle and breaks with an uneven fracture. It is from 5 to 5.5 in hardness and is heavy, having a gravity of 4.64 to 5.3. It is found in

streams and is often associated with gold, though also found where there is no gold. It occurs in schists and granitic rocks.

**ELECTRICAL POWER** is now transmitted at a satisfactory commercial profit in California at an approximate pressure of 60 kilovolts a distance of 230 miles. It is assumed within possibility that electric power is susceptible of similar transmission, commercially, 500 miles if in sufficiently large volume—200 megawatts. It is of further assumption that when so transmitted in such stated bulk, it would be commercially profitable to use copper wire of such a diameter that there would be no dissipation of brush discharge though there were 170 kilovolts between them.

The proper consistency of the pulp in pan amalgamation can only be determined by experience. If the pulp be thinned too much with water it will be impossible for the miller to raise the quicksilver through the charge and poor amalgamation will result, a large percentage of values escaping in the tailings. If the pulp be too thick by reason of insufficient water, the mercury will be reduced to such a fine state of division that "flouring" will result and much of the mercury and amalgam will in all likelihood float away on the surface of the water, taking values with it. The latter is the worse predicament, as not only are the values in the ore lost, but the quicksilver as well. The "happy medium" must be determined by experience or experiment.

The question as to which is the better—to treat sulphides at the mine by chlorination or some other process or to ship them to smelters—should be determined by the relative cost of these two methods of treatment. The first involves the capital invested in plant and its deterioration, as well as the actual cost of handling, roasting, chloridizing, leaching and the various losses sustained, both mechanical and chemical, throughout the process. The latter requires the consideration of sacks and sacking, losses in transportation and cost of transporting to smelter, return and wear and tear on sacks, smelter charges, moisture charges, losses charged by the smelter, etc. The question should be easily settled by a comparison of figures. A large chlorination works should treat sulphides cheaper than a small one.

**ARSENIC** occurs sparingly in native state, and various arsenides occur widely distributed, but the principal ore of arsenic is mispickel (arsenical-iron sulphide). It may be considered as iron sulphide ( $\text{FeS}_2$ ) in which one atom of sulphur has been replaced by one of arsenic ( $\text{FeAsS}$ ). The ore is crushed in rock breakers as it comes from the mine, is then usually passed through two or more sets of rolls to reduce the mineral to fine powder, and then passed through a furnace—generally a horizontal rotary furnace like a Bruckner or White-Howell. The arsenic volatilizes and passes off in fumes which are condensed in a chamber and subsequently collected and refined. The presence of pyrite associated with mispickel is not disadvantageous unless occurring in so large amount as to make the percentage of arsenic too small to be commercially of value.

If the boiler water gives trouble by formation of scale, the first step in correcting this difficulty is by having an analyses of the water made by some one experienced in this line of chemical work. This chemist should also be able to advise the best combination to use to counteract the scale. Boiler scale is due to two things, the presence of some mineral or organic substance in suspension, or in solution in the feed water. Soda ash, which is an impure carbonate of soda, is often effective in removing or preventing the formation of an excessive amount of scale, particularly in waters containing sulphates of lime and magnesia. The soda ash is not seriously detrimental to the boiler, and, in fact, its presence is to be preferred to the scale resulting from the presence of lime and magnesia. An excess of soda ash causes foaming, and should be avoided.

**MOST** millmen clean the outside apron plates in quartz mills too closely when cleaning up. In many instances this is due to the demands of the office, but if it were realized that this close scraping of the plates is detrimental and is not offset by the additional amount of gold obtained as a result of the practice, it would in most cases be discontinued. After such a close scraping the plate is left in anything but the best condition to resume amalgamation when starting up the mill after the clean-up, and much time is wasted in unnecessary dressing of plates. This loss of time and loss of gold usually more than offsets the additional amalgam obtained by close scraping. Nothing harder than a hard rubber scraper should be used regularly on the plates. In most mills too little time is given to dressing the plates, and too close scraping of plates is a common practice. This is particularly the case in mills where the ore is low grade—just the place where the opposite policy should be pursued.

**PURE GOLD** is not so quickly attacked by chlorine as that which is alloyed with a base metal, as copper. In chlorination works there is usually a fixed time for contact of the ore with chlorine, but the progress of the formation of ter-chloride of gold can be determined by experiment (taking samples and assaying). In the works, however, it is customary to work somewhat by the result of experience on former charges. If it has been found that the charge is sufficiently gased at the

end of twelve hours, the succeeding charge will probably be given the same time of contact. Should it be found to require forty hours or more, this is the time given. Such methods often result in loss, for its success depends upon absolutely uniform conditions. The roasted ore must have received the same treatment; the gas must be of the same strength and volume, and the moisture should be the same, but in practice these conditions from one charge to the next are rarely attained with exactness, and the result is that the tailings from some charges are much higher than others.

The cost per cubic yard of hydraulicking gold bearing gravel is dependent on so many factors that it is impossible to give an arbitrary figure. These factors are chiefly character of gravel, whether free washing or cemented by clay, lime or other material, amount of water available for washing and the head or pressure obtainable; height of the available gravel bank (a high bank can be washed relatively cheaper than a shallow one. Another, and not the least factor, is the grade of dump available. Without good fall it is difficult and expensive to get rid of tailings. There are other matters to be considered, such as relative amount and size of boulders encountered, etc. Some hydraulic operations have been reported as making a substantial profit on material running as low as 6 cents per cubic yard. Dredgers of the largest size operate at about this cost per yard, and the capital invested in a dredging plant is usually much less than in a hydraulic mine and plant. In some hydraulic mining properties in California the cost of ditch systems alone has exceeded \$500,000.

TO DETERMINE the number of cubic feet required to make a ton of ore composed of lead and iron or copper and iron minerals in a gangue is difficult if the character of the ores is not given. An ore containing lead 60%, iron 15% and a limestone gangue would require, if the lead and iron be sulphide, about 5.1 cubic feet to make one ton. There would be about 1385 pounds of galena, 562 pounds of pyrite and 53 pounds of limestone. This is dry weight. If the ore be measured as it stands in the mine it would require somewhat more, owing to the presence of moisture. An ore containing 3% iron and 15% copper, if the copper and iron minerals be pyrite and chalcocopyrite, with a porphyry gangue, would require about 11 cubic feet to make one ton in place. A ton would contain about 110 pounds of pyrite, 870 pounds of chalcocopyrite and 1020 pounds of gangue. An ore containing 3.5% copper (in the form of sulphide) and 10% iron as pyrite in a porphyry gangue will require 10.6 cubic feet to make one ton. A ton will contain about 380 pounds of pyrite, 200 pounds of chalcocopyrite and 1420 pounds of gangue. Ordinary quartz ore with but 1% or 2% sulphide of iron or copper is usually figured at 13 cubic feet per ton in place.

The so-called open cut or glory hole method of mining is undoubtedly the cheapest that can be adopted if the topographical conditions admit of it. It is usually carried on through the medium of a tunnel run underneath the cut and connected with it by a raise; but the open cut system may also be employed where no tunnel to the surface is possible, the ore going through a drift or crosscut to a shaft to be hoisted to the surface, as at the Alaska-Treadwell mine. The limit to which open workings may be carried has never been determined. At the Kimberley diamond mines, South Africa, the work was carried on to a depth of about 500 feet. Great caves of rim rock resulted, which led to an abandonment of this method. If the sides can be kept at an angle which will prevent caves, there is no reason why open cut mining may not go much deeper than 500 feet. In such large excavations the principal source of trouble and danger lies in the storm water which falls and runs into the cut, though usually the latter may be prevented. In a region of abundant rainfall, this becomes in time a very serious matter, and has as much to do with the limitations of the method as the falls of rock from the sides of the cut. Where possible, it were better to work two or more cuts to moderate depth than one having such great depth.

THERE is often a misapprehension as to the meaning of the terms "bond" and "option," as used in connection with prospective transfers of mining property. A bond is a written agreement between two or more persons whereby one of the parties to the instrument agrees to pay to the other party a stated sum of money at a specified time, in consideration of some act on the part of the second party, (in this case the transfer of the property in question to the first party). From this agreement, neither the prospective purchaser nor seller can withdraw without the consent of the other. An option is of two kinds, "buyer's option" and "seller's option." In the case of the former, the seller must transfer a deed to the property in accordance with the terms agreed upon whether he feels disposed to do so or not. In the "seller's option," the mine owner is not bound to transfer the property unless he sees fit. In either case, there is usually a forfeit of some sort. In the case of the buyer's option, the seller usually receives a cash sum in advance, or at stated times earlier than the date of consummation of the contract, or he considers the development work, which may have been agreed upon between them, to be performed at the expense of the buyer, as a sufficient penalty. Under the seller's option, the seller usually puts up a cash forfeit to "bind the bargain."



### The Mines of Cananea, Mexico.\*

Cananea mining district is in the State of Sonora, Mexico, 40 miles southwesterly from Bisbee, Ariz. Here a mountain range rises out of the sandy desert plain, composed of a light-colored igneous rock, with quartzites and limestone uplifted on its mass at the western end of the range. These rocks have been deformed, crushed and sheared by great compressive stresses, and it is along the zone of fracture and shearing that the principal ore bodies of the district occur. One of the notable features of the mineralization is the great masses of limonite gossan which are found capping the copper deposits at the surface.

The ore deposits are chiefly on the north slopes of the range, the trend of which is northwest-southeast. The mineralization is confined to the southern part of the range, the zone running with the axis of the mountains.

One of the principal groups of mines of the Cananea Company is called the Capote. The Capote basin is illustrated in the accompanying panoramic engraving. The ore body here consists of a mass of crushed

the Puertecitos on the north, a distance of about 8 miles. These rocks do not all contain ore, but it occurs localized along favorable beds. This mineralization is especially great at the southeast end of the range. As the outcrops have been weathered and leached, they now form great ridges of gossan. The Democrata is the most easterly, and between this and the Capote vein there is the Veta Grande, a big iron vein, and a large number of small veins in the limestone series, while in the porphyry and quartzite to the west the Oversight and Capote mines are found.

The Capote ore body consists of a mass of crushed porphyry, altered to a white, clayey material, and carrying scarf-like masses, strings and bunches of soft, black copper glance, with some residual pyrite. The southwest and southeast parts of the ore body consist of a shattered mass of quartzite whose joints, fissures and interstices are filled by ore. This crushed material has all the characters of an inter-fault mass; but no boundary fault slips were observed, and, where the boundary of the ore was seen, the transition to solid and lean quartzite or pyritized porphyry was very abrupt. The evidences that the glance is of secondary origin are clear and conclusive, both in the faces seen in the mine and in thin

The ores of the different mines vary considerably in character and value. In general, it may be stated that the ore from the group of mines nearest the smelter, embracing all the bonanza mines of to-day, is quite siliceous, occurring largely in quartzite gangue or an altered quartz porphyry. The ore from the Puertecitos group is less siliceous, the gangue consisting largely of calcite and garnet. The intermediate mine, the Elisa, has a chalcopryite ore that is siliceous, but carries, I was told, good values of gold and silver. In the Veta Grande vein large bodies of low-grade ore were encountered carrying native copper in a very siliceous gangue. This ore will average about 2.15% copper, but also carries about .38 ounce gold per ton. It is this ore which can be so easily and advantageously concentrated—tests showing, I was told, a saving of nearly 92%, and the concentrates having 22% copper and 3.6 ounces gold per ton.

(TO BE CONTINUED.)

### To Search for Platinum.

Owing to the increased demand for platinum, the United States Geological Survey is about to make an



Panoramic View of the Mines in Capote Basin, Cananea, Mexico.

and altered eruptive rock, much of it changed to kaolin, through which is scattered grains, veinlets and bunches of copper ore, chiefly a soft, black copper glance. The normal ore is chalcopryite, but this mineral in the upper part of the vein has been altered into a variety of copper-bearing minerals—sulphides, carbonates and oxides. Native copper is of frequent occurrence. The ore deposits are thus described by W. H. Weed in the Transactions of the American Institute of Mining Engineers:

**THE ORE DEPOSITS.**—The ore bodies of the Cananea consist of great masses of chalcopryite (and its secondary products, glance, malachite, cuprite, native copper, etc.), occurring in the altered sedimentary rocks, and in veins or fractures in which secondary concentration has occurred. The contact bodies are not, however, confined to the immediate proximity of the eruptive mass and are, therefore, not of the true Kristiania type. The rocks consist of series of beds dipping east about 60°, the original bedding of the sediments being clearly recognizable, since original differences in composition have produced different mineral composition. This is especially well shown on the west side of the mountains, along the wagon road from Capote to the sawmill, and also along the road from Puertecitos to the Elenita mine.

There is a belt of these contact metamorphic rocks extending from the Cobre Graude on the southeast to

sections of the ore, where the disseminated pyrite grains (of an altered porphyry, forming a dike in the quartzite of the ore body) are partly replaced by glance. The ore body is very large, measuring 275x135 feet on the 100-foot level and 165x100 feet on the 200-foot level. The ore is soft, as much of the porphyry is rotted; heavy timbers in square sets are used and the space filled with waste, as in the Butte practice. Much of the ore will run 15% as mined. In the rock cuts along the narrow-gauge railway the true nature of several of the lesser veins is recognizable as altered strata impregnated with chalcopryite, with small amounts of galena and blende.

In the Cananea district the vein outcrops are the most prominent features of the landscape in the vicinity of the mines now being worked. The enormous masses of iron ore, the gossan caps of the veins, form high ridges of rough, brown rock, traceable for long distances across relatively smooth slopes. Where the streams have cut across these vein outcrops, the deep and narrow gorges show excellent sections of the veins and the enclosing rocks. It is in such places that the earliest mining was done. The drifts and tunnels driven in the veins disclosed large masses of native copper, carbonates and oxide ores, the existence of which made the region well known throughout Sonora for the last half century. As the gossan cap is penetrated, the ore beneath is found to consist of pyrite and chalcopryite, mixed with much earthy and soft black copper glance.

examination of the platinum resources of the United States. It is proposed to collect the heavy sands from all placer mines in the United States where evidences of platinum have been observed. The samples thus obtained will be used in determining the best methods of extracting the various minerals which have economic value. It is hoped that the separation and sale of these useful minerals, such as magnetite, chromite, garnet, monazite, rutile, zircon, gold, platinum, etc., will, in many places, become a permanent and profitable industry. As a preliminary step to this investigation, the Survey invites the owners of placer deposits to contribute for examination samples of material likely to contain platinum. These samples, which should be sent by mail, must weigh not more than four pounds each. It is suggested that the gravel be concentrated before it is mailed. Careful note should be made on the package, or in a letter accompanying it, of the total quantity of original gravel which the concentrate represents, in order that an accurate idea may be obtained of the value of the gravel for the purposes under investigation.

Each package of sand should be accompanied by exact information as to the name and postoffice address of the sender, the name of the mine or claim from which it came, and the State, county, city, village, or district in which the deposit is located. It is desirable that the owner of each deposit should state what efforts have previously been made to sepa-

\* See illustrations front page.



rate platinum from his sand or from other sands in his neighborhood.

After the Survey has made an examination of these samples, experts will be sent to all localities where preliminary tests give evidence of platinum. The expert will report on the size of the deposit and superintend the collection of representative samples for concentration. Experiments in the concentration of platinum sands will probably be carried on in connection with the exhibits of mining machinery at the Lewis and Clarke Centennial at Portland, Or., between June 1 and October 15, 1905.

As a help to prospectors, the Survey publishes the following facts about the qualities of platinum:

Pure platinum is a silvery white metal with a specific gravity of 21.5. With the exception of iridosmium it is the heaviest metal occurring in nature. It is almost as hard as iron and is very malleable. Platinum does not amalgamate with quicksilver, is not dissolved by potassium cyanide when cold, is not attacked by acids, except the mixture of nitric acid and hydrochloric acid known as aqua regia. It is more difficult to melt than gold.

Native platinum has been found most frequently in gold-bearing sands. On account of its weight it remains in the sluices with gold and other heavy material. It is most readily distinguished by the

has been detected by assay in sands from Lancaster and Montgomery counties, Pa. The richest producer of platinum in the United States is the Rambler mine of Albany county, Wyo.

**The Cost of Bailing.**

Mine drainage is one of the most important factors in the expense of operating a wet mine. There are many mines fortunately situated in this regard which may be drained by means of tunnels, which, having been driven, the drainage problem is no longer a source of expense. The greater number of mines, however, are less fortunately situated, and the water must be raised by pumps, skips, hydraulic elevators, or by air devices. In the selection of a method for handling mine water there are many things which require careful consideration. Pumps are so various in design, efficiency and cost of operation that it is not always an easy matter to decide. The expense of power is one of the chief considerations, but in recent years, in many districts, the power problem has been simplified and its cost reduced by the introduction of electricity. Many mining districts, situated where fuel of any kind is expensive, and power accordingly high, have been greatly benefited by the

of a new vertical shaft through the hanging wall country rock some years since, and practically all the water of the mine is now raised by a large skip through this shaft.

The shaft here referred to is nearly 1400 feet deep, the water being hoisted from 1360 feet. The skip is made of steel plates and angle iron and has a capacity of 1500 gallons. The amount of water raised in twenty-four hours is 250,019 gallons, this being the daily average during 1904. The cost of power is \$10 per day; engineers' wages \$3 per day. There are three engineers employed, but the superintendent, L. W. Shinn, states that but two engineers would be required if no water were hoisted, consequently the services of but one engineer is charged to water hoisting. The cost of repairs is about \$500 per annum, principally the cost of a new cable once a year, which has been the average during the past five years. No charge has been made for depreciation, that item having been small and covered by repairs.

Nearly all the men and tools are handled on this water skip, and this service more than pays for any depreciation. No interest charge has been included in this cost of hoisting water, but if it were placed at about one-third of the interest on cost and depreciation of hoisting plant the total cost of hoisting 250,-



Panoramic View of Mines in Capote Basin, Cananea, Mexico.

following characteristics:

(1) Its great weight. In panning it remains behind even gold in the pan.

(2) Its white color. It is whiter than lead and is distinguished from amalgam by its smooth surface, whereas the surface of amalgam as seen under a good glass is rough.

Native platinum is usually very impure; occasionally it contains so much iron and so many other impurities as to be dark in color and not easily distinguished from chromite, with which it is commonly associated. It frequently contains iridosmium, which occurs as flat, angular scales, while platinum grains are usually rounded, like gold dust. Platinum nuggets are usually smaller than gold grains. Large nuggets are very rare.

Platinum seems to be more generally distributed through California than through any other State. It has been found in Butte, Del Norte, Humboldt, Mendocino, Placer, Plumas, San Luis Obispo, Santa Barbara, Santa Cruz, Shasta, Siskiyou, Tehama, Trinity and Yuba counties. Curry, Coos, Lincoln and Josephine counties in Oregon have produced platinum. It has been discovered in Nez Perces county, Idaho. A nugget of platinum was found in Rutherford county, N. C., in 1847, and one in Clinton county, N. Y., in 1880. Platinum has been reported from Custer county, Mont., from Lumpkin county, Ga., and from the beach north of Lituya bay, Alaska. It

introduction of electric power, transmitted from a distance. This is the case on the Comstock Lode at Virginia City, Nev., where the introduction of electricity has reduced the cost of power from \$20 per horse power per month to \$7. There are many other similar instances where a greater or less saving has been effected. The power problem, however, is only one factor to be considered, for where mines are drained through shafts by pumping or bailing power must be employed. And this is also the case where the air lift is employed, for power is required to operate the air compressor. In the case of the hydraulic ejector the water used under high pressure is equivalent to a power, in some cases, sufficient to operate a pump of a capacity equal to that of the ejector.

In considering the matter of mine drainage it is always interesting to have responsible figures representing the cost of raising mine water under stated conditions, for the purpose of comparison. In many California mines drainage is accomplished by means of skips, operated either alternately, with ore skips, or continuously. The Utica mines at Angels, Calaveras county, Cal., is one of the most extensively developed mines in the State, and is operated wholly through shafts. In the old shafts at the north end of the property the water has always been handled by skips, though at the Stickle shaft a pump has been in operation for many years. The more extensive development and operation of the mine required the sinking

000 gallons of water daily from a depth of 1360 feet would fall well within \$20 per day.

In this connection the following is of interest to those who are giving attention to the subject of mine drainage. The figures are from an article by A. H. Goff in The Engineer:

RATIO OF WATER TO AIR REQUIRED.					
For Lifts Not Exceeding					
25 feet	2	volumes of air to 1 of water.			
50 feet	3	volumes of air to 1 of water.			
75 feet	4½	volumes of air to 1 of water.			
100 feet	6	volumes of air to 1 of water.			
125 feet	7½	volumes of air to 1 of water.			
150 feet	9	volumes of air to 1 of water.			
175 feet	10	volumes of air to 1 of water.			
200 feet	12	volumes of air to 1 of water.			
VOLUME OF FREE AIR, AIR PRESSURE, SUBMERGENCE AND HORSE POWER.					
Lift, Feet.	Submergence, Feet.	Air Pressure.	Free Air Per Minute, Cubic Feet per Gallon.	I. H. P. Per Gallon.	
25	38	17	0.3	0.0184	
50	75	33	0.4	0.0428	
75	113	49	0.6	0.0828	
100	150	65	0.8	0.1320	
125	188	82	1.0	0.1910	
150	225	98	1.2	0.2544	
175	263	115	1.4	0.3150	
200	300	130	1.6	0.3808	

For the proper working of an air lift a certain



amount of submergence is necessary. For the most economical and efficient results a submergence of 60% should be used—that is, 60% of the total length of the water discharge pipe should be below the water level in the well when pumped to its full capacity. For instance, let us assume that in a well 200 feet deep when pumping the water sinks to 40 feet below the surface of the ground, and it is desired to lift the water 20 feet above the surface of the ground. This gives a length of pipe 60 feet to the water level in the well, and as this does not include the submerged part of the pipe it is only 40% of the total length of water discharge pipe; the total length will, therefore, be 60 feet plus  $\frac{1}{2}$  times 60, or 90 feet submergence, making a total length of 150 feet of water discharge pipe.

It is not safe, unless under very favorable conditions, to figure on raising the water by the air lift system more than 200 feet above the lowest water level in the well. Nor is it always safe to extend the horizontal discharge more than 500 feet, as the air lift is not adapted to pumping horizontally to any great distance, unless reinforced by a pneumatic direct pressure pump, or an ordinary piston pump, either of which, however, could be operated by compressed air from the same pipe that supplies the well.

Suppose, for instance, that it is desired to lift 120 gallons of water 100 feet high per minute. It will be seen by the above table that this will require 150 feet submergence, thus making 250 feet of water discharge pipe, sixty-five pounds air pressure, 96 cubic feet of free air per minute and a compressor developing 15.84 H. P.

### Reforms Needed in Mining.

TO THE EDITOR:—An impartial, impassionate review of the mining profession, one embracing disinterested but decisive criticism, can not fail to be productive of much benefit, though it may bring forth bitterness. This is because the profession has not been subjected to thorough investigation. While it needs improvement, and radical reforms, it remains apathetic, unappealing and almost paralyzed. It shows little progress. This is not attributable to lack of affection of mining engineers for their profession or to their dearth of interest in exalting it, it being certain that it inspires in them boundless enthusiasm. On the contrary, the immobility of the profession is more likely due to the excess of enthusiasm of some of those devoted to it, rather than want of it. Very likely the marvellous advance of the mining industry has created a form of fanaticism among mining engineers and this, falsely identified with superfluous ardor, has blinded them so that they are unable to act as they should. But it is too true that they have not kept pace with miners for the past thirty years and that their profession has remained dormant or inert, while the industry which they are supposed to guard and govern has made extraordinary progress.

Mining engineers have been accustomed to appropriate most of the credit for the magnificent development of mining during the past thirty years. They have no right to do this, but in doing so they do less wrong to those from whom they wrest that credit than to themselves. The law of compensation causes the boomerang to recoil and in this case it has come back to strike the mining profession. Resting upon the laurels which they unrighteously pluck from the brow of the mining industry, mining engineers have suffered a serious setback which appears retrogressive. They have allowed the industry to go ahead of them with such strides that their cherished profession seems to be left standing still, if not falling backward. Their excessive enthusiasm has degenerated into devout meditation and the result is that their profession suffers from the results of indolence, the greatest defect it could have, and not from conservatism, which is a quality slightly known to it.

No other industry so depends for its purity and progress upon its high priests as mining does, in this epoch, especially. Many owners, operators and manipulators of mining property devote themselves too much to schemes for reducing wages of their employees and swindling of unsophisticated speculators. Law is powerless to protect mining from the scoundrels who befoul it. All depends upon the mining engineers who sometimes sleep at their posts. It is time that they be aroused to duty.

One cause of the apparent lack of inventive genius in the mining profession is facility to earn money in it, combined with indifference of mining engineers as to the methods pursued by operators to interest the public in their schemes. Some mining engineers are absolutely averse to invention. Perhaps if rewards were in sight they would exert themselves. Inventors in other walks of life do not keep gain so much in view as those in the mining profession. They do not make so sure of the commercial value of the products of their brains as mining engineers do. For this reason it seems that not until the ingenuity of other callings is exhausted can that of the mining profession be expected to develop. Up to date, nearly all machinery and systems in mines have

been invented by persons not so intimately connected with the mining industry, and evidently mining will depend for some time on outsiders for inventions advantageous to it.

Important inventions by mining men, properly so-called, are indeed rare. It is forty-five years since the square-set system of supporting undermined earth was invented. Since then nothing of equal value has come forth from mining engineers. That system itself exemplifies the barrenness of invention among professional mining men. It is primitive to such a degree that it appears to have no original. It exposes mining to the charge of being in its infancy. No sensible person, whether familiar with, or ignorant of, mining, can fail to question why a forest should be transferred to the bowels of the earth and there erected in multiquadrangular form for the simple purpose of preventing caving. Some other system far more simple could have been thought out as a substitute, not to avert caving, but to dispense with timbering.

The only offset to the square-set system, namely, the open cut or removal of ground, which would otherwise be left overhanging and likely to subside, in order to evade the necessity of timbering it, shows how cumbersome are the methods of and how unimaginative are mining men. As loss of ores through caving of ground is easily avoided and the only real objection to caving is founded on the peril to miners, it is evident, even to the uninitiated, that some system as simple as the design of a bicycle, but infinitely superior to squaresetting and overhang cutting, could be invented. If the supporting of masses of great weight was not peculiar to the mining industry and, therefore, does not call the attention of men not intimately identified with that industry, there is no doubt the invention suggested would have come forth long ago. Perhaps the mining world would not be willing to change the level system, now, as a general rule, necessitating stations every 100 feet, although the reduction of the distance between stations even to 50 feet would not involve much additional expense, even in old mines, while the effectual economy would send the industry ahead many revolutions simply through the removal of an uncalled-for burden.

Three extraordinary problems must be solved before any advance worthy the name can be made in mining. These are:

1. Abolishment of timbering.
2. Reform of the system of overseeing.
3. Installation of reduction plants in the mines.

Enough has been said of the first. The second calls for investigation with increasing emphasis day by day.

The system of overseeing is absurdly antiquated and quaintly inutile. It could advantageously be abolished without a substitute being supplied for it in advance. Like the system of 100-foot levels, it is sustained almost entirely by superstition in conjunction with the lack of initiative of mining men. It is a case of "as it is with us so it was in the days of our fathers and so it will be with our sons."

As a rule, "shift bosses" in mines are hired bullies. Having no more actual knowledge of and experience in mining than the toiling miners, they are placed in positions as overseers simply because of their domineering abilities. Miners who have earned reputations as pugilists are usually selected as shift bosses, at least in Australia, South Africa and the Rocky Mountains. Indeed, shift bosses boast more of their prowess as sluggers than of their ability as miners. They are employed, not to direct and aid miners, but to intimidate them.

Modern miners are of too high intelligence to require the dominating supervision of overseers who cannot boast that they depend on their skill for their positions. Miners, especially those of the United States and Australia, will not give to the exacting shift boss what he expects. Molested, they rest on their machines. It is the overseer who shows his authority least that secures the best results from the operator, but such a boss is not appreciated by his employer. The latter, blinded by the superstition that shift bosses are indispensable, expects that the more progress a miner makes the more he can be made to make by the urgings of the boss. Nothing could be more erroneous. The intelligent shift boss, exception though he be, knows that as a shift boss he is superfluous and, therefore, shows himself as little as possible to those subject to him. Miners feel as though they are considerably treated by the overseer only when the latter keeps out of sight. They are irritated by his visits, for each visit means so much loss of time to them. Even if they worked better with the overseer present than when absent, the latter would not be earning his salary, since he cannot devote more than half an hour of his time to each miner under him. But miners know what a "shift's work" is, and they usually accomplish it. The presence of the boss does not affect their exertions.

An overseer is necessary only for miners of little experience, and it is a curious mine in which there are enough inexperienced men to require an overseer. The skilled miner needs no boss. He is superior to his overseer. He knows better than any boss his machine, his ground and his duty. The less boss the more miner.

The abolishment of the system of overseeing, without any substitute being furnished for it, might disturb matters. If a substitute can be found, such as a monitor system, well and good. A complete reformation should be easily brought about.

Nearly ten years ago I suggested that reduction plants be installed in mines instead of on surface. Up to date the suggestion has not been acted upon. This is because of lack of initiative among mining men. No invention is necessary to effect the reform proposed. Inaction is the cause of its being neglected. However, another ten years cannot pass without steps being taken in the direction pointed out. This is not because mining men wish to avoid the unnecessary expense involved in hoisting material from great depths to the surface. They prefer the extravagance of old methods to the risk of innovations. But when the tensile strength of steel cable is exhausted they must, perforce, place milling and smelting plants well down within the bowels of the earth.

In a few years the leading mines of the world will be too deep for operation through a single section of shaft. Some shafts have reached depths of 4000 feet. Steel cable cannot be used to hoist loads from much greater depths at a single winding. The margin of safety has already been excessively encroached upon. It would be criminal to hoist men from a depth of 5000 feet with a single length of steel cable. When such depth is reached in a mine a hoisting plant must be placed below, especially if the earth is to be penetrated to still greater depths. Then the mill or smelter must be introduced into the mine, since it would be the height of folly to hoist ores to the surface.

The innovations suggested in this article would work hand in hand. The caving system would be aided by the slimes and slags made available by the proximity of the reduction plants, if requiring aid. Cost of mining would be reduced fully 30%.

Such economy as could be effected in this way is not only legitimate and just, but magnificent as well, as compared with such retrenchment as reduction of wages, which is often considered the great desideratum among mining men. Saving money at the expense of miners is not only iniquitous, but preposterous. Something nobler must be inaugurated. Methods of economizing labor without reducing wages should be brought into vogue. A mining man who schemes chiefly to cut wages is inefficient.

It is questionable if wage lowering ever effects economy. A 10% fall in the price of skilled labor of miners invariably results in a 5% diminishment of their usefulness. There are no workingmen who appreciate good treatment by employers as much as the American and Australian miners, and yet they resent bad treatment more than any other laborers. They guard vigilantly their own rights and respect the rights of employers who are just toward them, but they will shirk, and botch, and steal ore in mines belonging to those who would reduce the narrow margin between them and want. Moreover, the danger of strikes through lowering wages more than offsets the slight showing of economy which may be left after the permanent diminishment in the standard of efficiency of miners.

There is but little doubt that the increase of wages of miners results advantageously to operators, at least in districts where there are competing mines. Antagonism among mine owners which brings about increases of wages for their employees is far more praiseworthy than co-operation to cause reductions. This is not only because of advantages bestowed on the miners, but because of benefits reaped by the employers as well. A 10% increase in miners' wages is always followed by a 5% improvement in their efficiency and, what is more, an avoidance of strikes and friction.

No men earn their living so worthily and with so many personal sacrifices as miners. They are more subject to the sweating process, are more liable to dangerous illnesses and have more uncomfortable surroundings than any other class of men. While disposed to suffer from terrific headaches following the handling of dynamite, they have the sword of Damocles constantly hanging over them.

The mining profession requires men who are superior in intellect to those who have the sordid desire to reduce wages. Mining engineers should devote themselves to searching for methods to save labor in the interest of humanity and to increase wages in the interest of industry. Working underground, under prevailing circumstances, is no fit way for a human being to gain a livelihood and, consequently, every invention which takes men out of the mines is humanitarian and every increase of wages exalts the mining industry, in that it raises the efficiency of miners and encourages invention among them and among mining engineers as well.

After all, the principal charge against mining engineers is that of criminal neglect for having permitted so many frauds to be perpetrated in the name of the mining industry and for failure to attempt to prevent more from being committed. It is entirely within the province and easily in the power of mining engineers to block the unscrupulous exploiters who invade the mining field. Governments can do nothing to protect the investors. In this age of graft they have all they can do to protect themselves against thieves. It is so easy of accomplishment by mining



engineers that it is surprising that scoundrels are not expelled from the mining fraternity. The policy of "leaving the other fellow alone" must be discarded. The "other fellow," the fraudulent promoter, must be forced to the wall so energetically as to break every bone in his body and afterward his body must be trod upon until it shall have mixed with the mud and disappeared. There is no more contemptible thief than this fellow who can not be reached by law, but can be gripped by the mining profession.

One upright mining engineer should outweigh a million dishonest promoters, but he doesn't, simply because investors do not know how to regulate the mining scales.

The most abominable swindles are those committed through the medium of properties in Australia, South Africa, Mexico and the United States.

But it is a mere question of methods. Mining engineers are fearful of the libel laws when there is really no need of fear. The truth about any mining swindle can be established before application of the libel laws can be made.

Frauds committed in South Africa have been of such magnitude that they should have been apparent.

Through Mexican mines Americans have been swindled year after year. Saltieg is extensively carried on. Proprietors of claims hundreds of miles distant from genuine discoveries inform the public that those discoveries immediately adjoin their holdings.

Coal is scarce in Mexico, selling for \$15 per ton. Discoveries of fuel cause excitement and wild speculation. Unmarketable lignite and worthless obsidian are exploited. The fakir sends to Pennsylvania for specimens of good coal, has them assayed in the City of Mexico as samples from his Mexican "coal" lands, flourishes the certificate of assay to prospective victims, and sells shares, and the investors never even suspect.

Dozens of mines deserve to be closed as much as dens of counterfeiters. The greatest crime committed through them is the leading astray of labor. Armies of miners delve in worthless properties. Their energies are diverted fraudulently from other walks of life. As all labor should be productive, a direct violation of the laws of humanity is done in this way. Society may excuse the existence of millions of soldiers, but mankind cannot afford the unwarranted waste of labor involved in the false utilization of the toil of miners. In these days, when cost of living constantly increases, every worker should be a producer. Promoters of wildcat mining companies not only rob the honest investor, but seduce the healthy toiler—the toiler who earns his living by contributing to the general welfare. Mining prostitution of labor is the foulest of all prostitutions, and must be stopped. It is the final step in the debauchery of industry.

Too often does the young mining engineer, in his eagerness to secure a start in his career, take unclean risks, such as those involved in the management of wildcat mines. He depends upon a rotten branch to suspend himself over a precipice. His fall is almost certain. And there is no necessity for it. A longer course in ethics in school would convince him of this. But, at all events, it is better for him to abandon his profession than to seek to follow it in the manner mentioned.

I make these suggestions believing mining to be too great an industry to be subjected to exploitation by scoundrels, and of too bright a future to be held back by lack of invention and initiative on the part of those whose duty it is to keep it advancing. Mining is now at the stage when it must give up its policy of slight variation and slow transformation. Reformation must be undertaken. Infancy will no longer serve to excuse its faults.

City of Mexico, March 25.

JOHN DWYER.

## THE PROSPECTOR.

Fluorspar may be either white, colorless, blue, green, pink, or other colors due to iron and other oxides. It may be either transparent, or sub-translucent. The streak is white whatever the color. It is above the average in specific gravity, being 3.01 to 3.25. Quartz may be compared, being 2.6. Barite is heavier, being 4.3 to 4.6. Fluorite is comparatively soft, having a hardness of 4, easily scratched by a knife. It commonly crystallizes in cubes or some modified form of the cube. It does not effervesce with either hydrochloric or nitric acid, but is attacked by sulphuric acid with the formation of hydrofluoric acid, which will etch glass.

The mineral samples from Humbug district, Yavapai county, Ariz., are wolframite, a tungstate of iron and manganese. The mineral is valuable for the tungsten which it contains, which is used in steel making.

The mineral from Bearmouth, Mont., is a crushed and sheaved greenstone, now altered to talcose and chloritic material. It is what might be termed the "gouge," "vein matter" or "cab" (Cornish) of the vein. It contains iron sulphide (pyrite). Material

of this character is not infrequently gold bearing, but is generally low grade. It should be assayed for gold. This "The Prospector" cannot undertake to do.

The rock specimens from Graniteville, Cal., are: No. 1 is quartz, containing a very small amount of sulphide (iron and copper). No. 2 is quartz, to which is attached on one side a remnant of siliceous tale schist, from the wall probably. This specimen contains sulphides of iron and copper. The iron is light yellow, the copper dark yellow (chalcopryite), a small amount of bornite is also present (a dark purple-blue sulphide of copper). No galena can be seen, but there are a few scaly crystals of a mineral of lead or galena color, which are probably nagyagite, a telluride of lead, silver and gold. Both samples are probably gold bearing.

The mineral from Yreka, Cal., having a black color and submetallic luster, with bright green scales and veinlets distributed through it, is chromite, commonly known as chrome iron. It contains, when pure, chromium sesquioxide 68%, iron pentoxide 32%. The specimen is a good, clean ore of chrome. If the ore is situated where it may be cheaply mined and shipped it may net the owner a few dollars per ton. The value in New York is about \$15 per ton. The low price is due to the large importation of foreign ores on which there is no duty.

The rock from Piru, Ventura county, Cal., is an altered greenstone, now mostly chlorite, containing magnetite.

## Grading Analyses.\*

NUMBER II—CONCLUDED.

Written by H. S. DENNY.

The differences are hardly appreciable, and show that the work has been carefully done, and that there has been very little variation in the nature of the ore or in the screens used. It will be noticed on examining the values of the different grades before passing the plates that the poorest in every case is the coarse mesh—that is, the product remaining on the 60 mesh—which varies from 3.6 to 4.9 dwts. per ton. The richest is the percentage passing through 150 mesh and remaining on 200 mesh. After passing the plates the pulp is divided into slimes and sands, and it is interesting to notice what has happened to the various products. The first point that strikes one is that there is practically no extraction by amalgamation in the product remaining on 60 mesh. In the month of August it shows slightly higher in the sands charge than in the screen sample, but taking it throughout it remains the same. The product remaining on 100 mesh with an average of about 8.34 dwts. in the screen sample shows a value of about 3.82 dwts. in the sands charges, meaning in effect that about 57% of its contents has been extracted on the plates. The product remaining on 150 mesh, averaging 17.2 dwts. in the screen sample, is reduced in the sands charges to 3.74, representing 78.3% extraction by amalgamation. The percentage remaining on 200 mesh has a value of 19.22 dwts. in the screen sample, and is reduced to 3.28 dwts. in the sands charges, showing an extraction of 82.95% by amalgamation. The portion passing 200 mesh shows a value of 10.3 dwts. in the screen sample, and is reduced to 5.16 dwts. in the sands charges, showing an extraction by amalgamation of 50%. These are interesting figures, and they clearly point to the fact that the finer the sands the better the extraction by amalgamation. They also show that the portion passing 200 mesh, consisting probably of partly argillaceous slimes, does not show such a good extraction by amalgamation as the fine sands remaining on that screen. The next comparison is between the residues from the sands charges and their originals. It will be noticed that the highest value in the originals is in the percentage which passes the 200 mesh, all the other grades being lower and fairly uniform in value. Coming to the residues, we find that from an average value of about 3.85 dwts. in the charge remaining on 60 mesh the average residue is about 1.27 dwts., the average extraction, therefore, amounting to about 66%, while in the product passing 200 mesh from an average value of 5.16 dwts. we get a residue of .53 dwts., representing an extraction of about 90%.

Here, again, we have an illustration showing that our fine product is in a condition to rapidly yield its gold, and although the portion which passed 200 mesh in the screen sample did not show a very high extraction by amalgamation, it clearly proved to be very amenable to the subsequent cyanide treatment, yielding a very high percentage of extraction. Thus the portion remaining on 60 mesh in the screen sample shows an extraction in the joint operations of amalgamation and cyaniding of only about 66%, while the portion remaining on 200 mesh, showing an original average value of 19.2 dwts. as against .28 in the residue, gives an extraction of over 98%, representing an improvement of 32% in favor of the latter.

It is quite obvious, therefore, from a study of these

figures that the product remaining on 60 mesh is not in a condition to yield its gold to either the amalgamation or the cyanide processes, and that, therefore, it should be reduced further in order to give extraction more nearly approximating that won from the product remaining on 200 mesh.

The one point that requires some explanation is that the product passing through 150 and remaining on 200 mesh gives a better extraction (98%) in the joint processes than that passing through 200 mesh (about 95%), and this I can only ascribe to the presence of clayey matter—that is to say, the separation of sands and slimes is not so efficiently done as it might be. A study of this point led me to go carefully into the capacity of our sands plant and spitzkasten separators at the Van Ryn, and there is no doubt in my mind that the cause of this percentage of slimes in the sands is, first, inadequate capacity in the spitzkasten; second, incapacity in the tanks; third, inefficient flood gates in the settling tanks.

The above remarks are, I think, sufficiently full and clear to support my contention that the grading analysis is full of most important information in regard to the work being done right through the treatment plant. It has shown, firstly, what can be done by amalgamation, and what product is best suited to amalgamation; secondly, what product is unsuited to amalgamation; thirdly, the product best suited to the ordinary cyanide treatment, and that most unsuited; and fourthly, where losses are being made and why they are being made, and indirectly points to the possibility of largely decreasing capital expenditure in the cyanide plant owing to the reduction in the required time of treatment, and I submit that a simple analysis such as this is, that can afford such extensive and important information, is one that should not be neglected on any mine.

Similar analysis sheets were also prepared for the Meyer & Charlton, the New Goch, and the Roodepoort United Main Reef companies, which bear out the same conclusions to a greater or less extent. There are some interesting comparisons as between these mines, but those comparisons are hardly part of the subject matter of this paper. The variations are of more interest to the companies concerned than to this particular discussion. I must point out that in the case of the New Goch, concentration is resorted to after the pulp leaves the plates, and this fact must be borne in mind in analyzing the results on that mine.

**GENERAL CONCLUSIONS.**—The obvious conclusion from a study of the figures given under the last head is, that as the "coarse" particles are the poorest in the screen assay and the richest in the residues, as opposed to the "fine" particles, which are richest in the screen assay and poorest in the residues, there is a necessity for an alteration in our present methods of reduction. I do not wish to labor the subject of fine grinding, of which so much has been heard recently, but the only conclusion which one can draw from the figure given is, that the coarse production should be separated out and reduced to a mesh, somewhere between 150 and 200. The immediate result would be increased extraction in the cyanide works; against which, however, must be set the cost of regrinding.

Another point of very considerable importance is that to-day, in the attempts to get good extractions from the coarse particles in our sands plants, we are giving an average treatment of some six days. If there were no coarse particles—that is to say, if everything were reduced to a mesh between 22,500 and 40,000, it is more than probable that the six days' treatment could be reduced by 50%. The important bearing such a possibility has on the capacity required and the initial outlay involved in a modern sands plant demands your most careful consideration.

To-day, I believe, the majority of mining engineers are agreed that fine grinding must be resorted to. There is some division of opinion as to whether the whole of the fine product will then be treated in one operation or whether a classification will still be made of sands and slimes, and only work on a large scale on the two lines indicated can determine which is the more suitable method. Personally, I lean to the one-production-one-treatment proposal, but the pros and cons of this problem may more suitably be dealt with at a later date and under another head.

Finally, I think the grading analysis has shown that certain alterations in our treatment practice are not only desirable but necessary. The metallurgical difficulty has been clearly indicated, and shows where the trouble lies, and it now remains to provide an efficient and cheaply maintained grinding machine and a simple continuous treatment apparatus by virtue of which we shall, firstly, reduce our ore to a fineness consistent with high extraction, and secondly, continuously and economically separate our treated products from their gold-bearing solutions, leaving only the smallest value in our discarded residues.

It seldom pays to mix rich ore with poor, even when the lower grade material pays a profit. It is usually more profitable to treat each grade separately, as the large volume of low-grade material handled with the smaller amount of high-grade rock is likely to cause heavy mechanical losses in the latter.

\* Abstract Trans. S. A. Assn. Engrs.



## An Undeveloped Country.

Written for the MINING AND SCIENTIFIC PRESS by F. S. DAVIS.

Lying just south of, and adjoining, one of the richest and most progressive States in the Union, the peninsula of Baja (Lower) California is one of the least developed countries of its size known to mankind.

Yet this peninsula was one of the first known spots in the new world to be settled by venturesome Europeans, for nearly a hundred years before our Pilgrim fathers froze to Plymouth rock—in 1533, to be exact—a settlement was made by the Spaniards at La Paz, Lower California.

Further exploration discovered large tracts of barren, arid desert, ruled over by Baal, the sun god, and so the settlements died and it became a haven for unlicensed pirates, who thrived and waxed fat, until

Yet this eastern coast line is rich in varied resources. La Paz is just commencing to find the mineral value lying within her borders; Mulege is beginning to "sit up and note the world do move," and at Santa Rosalia, the Frenchmen are watching with an anxious eye every Yankee who lands there.

As things are at present, El Boleo, the French company which owns Santa Rosalia, is the great drawback to the development of the whole of the east coast north of their property.

They have built here a town of 6000 inhabitants (8000 in the winter), well laid out streets, with concrete sidewalks, sewer and water systems, and lined with comfortable wooden cottages; built a pier, breakwater and smelter, and railroads to all their mines—seventeen in number—and maintain a fleet of ships to France and smaller ones to connect them with the mainland of Mexico. The mines have paid for all these improvements and regular dividends beside.

The absence of any good, natural harbors near

for consolation revealing here and there rich and large mineral deposits

There are big overlays of lava and scoria that can be understood; but half way to the coast are up-thrusts of basalt on top of black obsidian. A pumice stratum is overlaid with sandstone, and this again by jasper.

A big hill of disintegrated granite is superimposed on an immense base of quartzite.

A vein of high-grade galena cuts boldly into a jasper vein, and just across the gulch it reappears in nodules and stringers in a bank of solid gypsum.

There are big blanket deposits of quartzite rich in iron and copper and disintegrated surface material carry 80 cents per ton in gold.

There are quartz, jasper and onyx ledges, dikes of porphyry and blowouts of basalt.

There are hills of calcite, gypsum, breccia, granite and alum

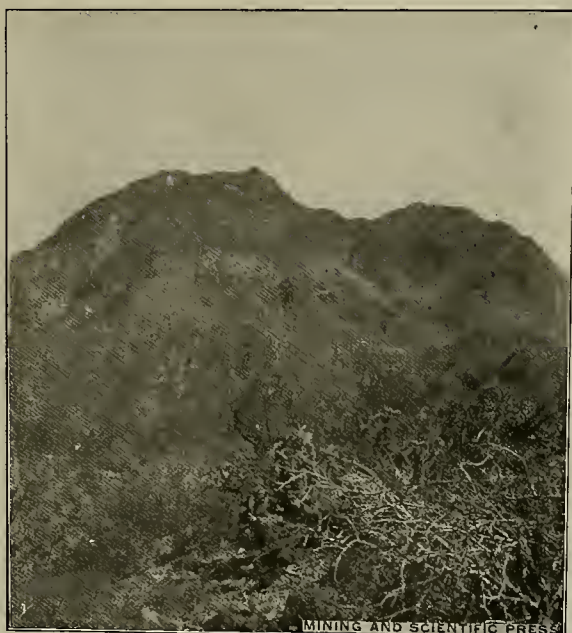
There are veins of magnetite running over 60% iron and immense copper blankets assaying an aver-



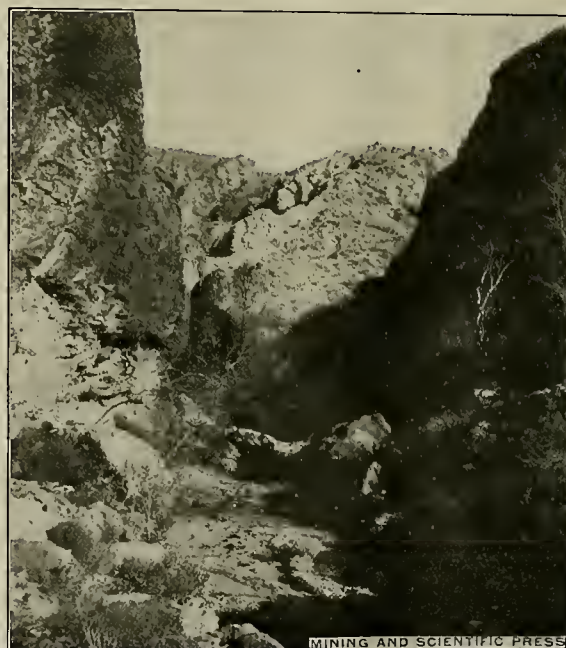
Camp at a Spring in the Santa Marias, Baja California.



The Giant Cactus and Mountain Sheep, Typical of Baja California.



La Reforma Peak in the Santa Maria, Baja California.



Santa Maria Mountains Seen Through a Gorge in Lava Fields, Baja California.

King Philip II of Spain sent an expedition about the middle of the seventeenth century, drove out the pirates and established another settlement.

Settlement after settlement was attempted and not until about 1890 was permanency established.

Innumerable colonization schemes have also fallen through, yet the climate is salubrious and the temperature very equable.

Roughly speaking, the peninsula is about 600 miles long with an average width of 60 miles.

Its general trend is northwest and southeast, extending from 32° 40' N. L. to 23° or below the Tropic of Cancer line.

Throughout its entire length a range of mountains, rising boldly from the eastern or gulf side, slopes gradually away toward the Pacific.

Many fertile valleys lie in the interior and each one has its quota of Mexican inhabitants, burros and dogs, yet none of these valleys have their possibilities more than partially developed.

Along the gulf shore the development is still less, for San Jose del Cabo, La Paz, Mulege and Santa Rosalia are the chief settlements in all that long stretch of about 1000 miles of seaboard.

there gives El Boleo a practical monopoly and absolute domination over all the adjacent territory, and they surely exercise their power, for they own the only port of entry and egress, and their "word is law" at the custom house.

Ostensibly the Boleo group are copper ores, but some of them also run well in gold and silver values, but it is all reduced and shipped as copper matte to France, where it is refined, thereby avoiding the heavier duty on gold and silver.

Now, the big mineral deposits of El Boleo do not stop at the Boleo line a few miles north of Santa Rosalia, but the outcrops can be traced 20 miles away, and some day another Boleo will be worked there.

The Santa Maria mountains are about 15 miles north of Santa Rosalia, and contain great mineral deposits as yet undeveloped. Rising boldly from the gulf the highest peaks attain an elevation of 4400 feet, less than 5 miles from the coast.

It is a nightmare of a country to travel over, unless with a flying machine, for that 5 miles is set on edge, seamed with deep arroyos and frightful precipices, bearing everywhere evidence of volcanic action, but

age of 7%. A galena vein outcrops in places for about 2 miles, and a quartz lode carrying low gold values on the surface can be traced fully 3 miles.

Some of the outcrops lie directly at the base of the highest peaks and apparently extend away in under them.

Probably a tunnel into the mountain would tap plenty of water, and water is a desideratum, for the nearest springs are 5 miles away, over an extremely rough and painful trail.

On the northwest and southwest sides of Santa Maria proper, fully 2500 feet above sea level, grow many Taco palms, and, as palms require water and much of it, the inference is that their roots are in moist soil, for they flourish and bear their fruit each season.

The present trail to the coast is about 8 miles, which could be shortened to 6 miles by a rope tramway, and power enough developed thereby to run a dynamo. Such problems would have to be worked out by the superintendent, however—that's what he's there for.

Half way to the coast is a small warm spring,



slightly sulphurous, but quite soft, and excellent for culinary, drinking and washing.

During the rainy season almost every arroyo has its spring; but most of them are so impregnated with alum and gypsum as to be unfit for washing, let alone drinking.

If the smelter be established at the coast, water can be had in many of the arroyos by digging, or a distillation plant could be installed.

Good hard mesquite and palabanco, both excellent firewoods, are abundant and can be bought, delivered at smelter, for about \$4 Mexican (\$2 in gold) per cord.

The other woods indigenous to that section are tovote, dipurer, copal, copal quien, wild fig, date palm, Taco palm and unas gatos (cat's claws).

A breakwater would have to be constructed, for when a gale does come from the northeast, woe to the vessel that is forced against Santa Maria's rocky sides.

The shore is quite abrupt under the gulf waters, and in most places, 200 feet away from the water's edge, the biggest steamers could float with plenty of water under their keels.

There is abundance of hard lava or trap rock on the shore to build piers and breakwater, and the slag from the smelters could be utilized to bond them together.

Another item of some moment is the fact that for about \$15 per month and his beans and flour a Mexican will keep a big camp supplied with fresh and dried fish and turtle.

Probably no other waters in the world are so prolific of fish and sea turtle as the Gulf of California. Last year turtles were selling there for dos reales (25 cents Mexican) each, or about 10 cents gold.

In the Santa Marias themselves are many mountain sheep and deer, rabbits, quail, foxes and chaparral cocks (road runners).

Mexican laborers are plentiful for from 50 cents to \$1.50 (gold) per day, and any company going in prepared to do business will shortly find a large number of natives clamoring for work with them very soon after starting.

It is not a poor man's proposition, for the ores are sulphides and smelting, and the seekers, therefore, must go prepared to run a vessel for supplies to Guaymas and be wholly independent of Santa Rosalia.

There is an abundance of fine fire clay and several veins of kaolin scattered all the way from the heads of the arroyos at the base of Santa Maria to the coast.

In the whole district herein described there is only one mine claimed at present, and it has not been producing since 1893, having lain idle for want of capital and proper management.

The reported assays of this mine, made on the galena vein, are \$6.50 in gold, \$202 in silver (lead not given), by E. Martinez, Mexican Inspector of Mines.

Rightly handled, there is much money for somebody in this locality; but the Mexican proverb, "Una mina quiere otro," ("A mine needs another,") to make it pay, was never truer than in this instance; yet somebody some day will take hold of Baja California, and, in developing its wealth and resources, add to his own and the world's stores.

May it soon be, and the peninsula no longer rank as an undeveloped country!

The accompanying illustrations give a good idea of the character and ruggedness of the country, its vegetation and inhabitants.

### Losses in Treatment of Telluride Ores.\*

Written by A. MONTGOMERY.

It has been the custom of some of the large mines at Kalgoorlie to ship their richest telluride ore either to the Fremantle Smelting Works for treatment or to smelters outside the State, while others contend that a better financial result is secured by roasting the ore locally and treating it by amalgamation and cyaniding after roasting. The advocates of smelting hold that the higher extraction of the precious metals more than makes up for the greater cost of treatment, while the mill men claim that they can extract so much of the metal contents of the ore at a low cost that they can afford to lose the values contained in the tailings and yet show a better financial result in the shape of net profit than if they had sent the ore to the smelters. As the supply of this rich ore to the smelters is at present their mainstay—the quantity coming forward from other sources being small—it was evident that their whole existence depended on their being able to compete successfully with the local mill treatment, and my inquiries were, therefore, directed to ascertaining what were the respective costs and profits resulting from treatment of the ore by the rival methods. Let it be once established that the local treatment gives the better financial result, and the supply of ore to the smelters must inevitably cease. To my surprise and disappointment, I was unable to get from any one of several managers, to whom I went for information, really conclusive figures showing a complete comparison between the two methods on an ore of equal value;

no one seemed ever to have divided a large parcel and treated one half of it by the one process and the other half by the other, to obtain an absolute comparison. The advocates of local roasting and cyaniding treatment appeared to have relied all along on comparative figures showing the costs of the one process as against the other, which would be quite correct if all the costs were taken into account. But when I came to make inquiries I could not find that any one had determined the very important point as to whether there was any appreciable loss of gold by volatilization in the roasting process, which is liable to be quite heavy under certain conditions when salt is present in the roasting charge, as it is in the Kalgoorlie material.

As all the ore raised from the Boulder mines is moistened with the extremely salt water found in them, it is evident that the presence of salt is usual even when the ore is crushed dry and submitted to furnace treatment.

So far as I could learn, very little attention has been paid at Kalgoorlie to possible and probable loss of gold in roasting, it having been generally assumed that the volatilization losses, if any, were so slight as to be negligible. In many cases I found that no systematic assays of the ore were made before it went into the roasting furnaces, and that the extractions reported were based on the assays of the roasted ore, and I did not meet with any person on the field who was able to tell me positively from actual trials whether the loss by volatilization was great or small. It could be easily ascertained by systematically assaying the pulverized ore before roasting, the most perfect sampling being obtainable from this finely ground product, and again assaying the roasted material, making due allowance for the difference in weight due to the roasting. I regard it as a severe reproach to the Kalgoorlie metallurgists that any doubt should be possible on an important point such as this, and have deliberately drawn attention to it in this report in order that steps may be at once taken to have the question thoroughly gone into and conclusively set at rest. While I admit freely that laboratory tests on a small scale are not conclusive in such a matter, it is nevertheless clear that if they show a loss there is a strong presumption that a similar result will be got on the working scale, and demonstration to the contrary is imperative before the presumed loss can be neglected. That there is a loss in roasting Kalgoorlie telluride ores on a small scale is proved by the following experiments supplied to me by J. W. Sutherland:

#### GOLD PRESENT BY ASSAY.

	Raw Ore, Ozs. per Ton of Raw Ore.	Roasted Ore, Ozs. per Ton of Raw Ore.	Loss, Ozs.	Loss, Per Ct.
Fine concentrates.....	5.15	5.00	0.15	2.91
Coarse concentrates.....	4.15	4.00	0.15	3.61
Sulphide ore.....	4.25	4.15	0.10	2.35
Average.....	4.52	4.38	0.13	2.95

A loss of 2.95% is equal to 2s 7.357d per fine ounce, taking the net value per fine ounce at £4 4s 7d, which is about what Kalgoorlie gold comes out at, after deducting mintage, escort, freight and insurance charges, from the field to the Perth mint. On ore of eight-ounce grade, such as is often shipped to the smelters, this loss would amount to £10s 11d per ton of ore. If the actual working process produces a similar loss by volatilization, the amount of gold escaping through the roasting furnace stacks at Boulder must be worth a very large sum of money annually.

Returning to the relative costs of smelting and milling, G. M. Roberts, of the Great Boulder mine, let me have the following figures of the cost of shipping ore to smelters at Fremantle and Dapto, on the basis of stone containing 8 ounces of gold to the ton:

	Fremantle, £ s. d.	Dapto, £ s. d.
Bagging.....	0 15 0	0 15 0
Cartage to station.....	0 1 3	0 1 3
Railage.....	0 16 4	1 6 0
Wharfage.....	0 2 9	0 2 9
Fremantle agency and charges.....	0 10 0	0 10 0
Marine freight.....	0 1 9	0 1 9
Marine insurance.....	0 1 0	0 1 0
Dapto charges.....	2 15 0	2 7 0
Smelting charges.....	0 1 0	0 1 0
Sydney wharfage and agency.....	0 1 0	0 1 0
Percentage of assay value retained by smelters.....	1 5 7	1 5 7
Totals.....	4 18 2	5 7 3
Loss of gold values, fine gold paid for at £14n ounce only, 8 ounces at 4s 7d.....	1 16 8	1 16 8
Grand totals.....	6 14 10	7 3 11

We may summarize the above charges thus:

	£ s. d.	£ s. d.
Transport charges.....	0 17 7	3 0 3
Smelting charges.....	5 17 3	4 3 8
Totals.....	6 14 10	7 3 11

These being the deductions to be made from the absolute assay value of the ore, that is, for 8-ounce stuff, from £33 16s 8d, taking net Kalgoorlie value of fine gold.

The treatment costs per ton at the Great Boulder Proprietary mill for the month of June, 1903, are given by Mr. Roberts, for comparison, as follows:

#### SULPHIDE MILL.

	s. d.	s. d.
Crushing and delivery of material.....	4 7.28	
Roasting.....	3 9.83	
Amalgamating.....	1 6.88	
Supervision (including salaries).....	0 3.81	
Assaying, electric light, clerical, etc.....	0 4.51	
Totals.....	10 8.31	

#### CYANIDE MILL.

Mixing, agitator, and filter pressing.....	4 6.56
Disposal of residues.....	0 11.41
Precipitating.....	0 2.92
Supervision (including salaries).....	0 2.23
Assaying, electric light, clerical, etc.....	1 4.01
Total.....	16 11.44

To compare these with the smelting costs, we have next to consider the values left in the residues, and this presents some difficulty, for the high-grade ores that are sent to the smelters are not sorted out and treated by themselves in the mills, but are mixed with the general produce of the mines. When ores much above the ordinary average of richness are being treated, I understand that it is the general experience that the tailings values also increase, and it is argued from this by the advocates of smelting that if the ores of high grade were sorted out and specially milled by themselves, the tailings would be of high value also. I think this conclusion is a just one, and that the tailings from such high-grade ore would require at least a second treatment, and, possibly, a third, before they could be safely run to waste. It is reasonable to suppose that this is the case also even when the richer ores are mixed with so much poorer material that the average grade is reduced to that of the ordinary run of the mine, and the tailings from a single treatment are no richer than usual. A numerical example will make this clearer. A mine produces, say, 4000 tons a month of ore worth £3 a ton, and 200 tons of picked ore worth £33 a ton. The average value of the 4200 tons would then be £4 8s 7d a ton. If the poor ore were treated separately the residues would probably average about 6s a ton, but if the whole lot was treated together, 8s a ton in the residues would not cause any alarm—but what would it mean?

Total value in tailings.....4,200 tons @ 8s = £1,680  
Total value in tailings.....4,000 tons @ 6s = £1,200  
Difference due to richer ore.....200 tons = £480

Or at the rate of £2 8s a ton. It would obviously be far better practice to treat the rich ore separately by itself, with repeated re-treatments of the tailings, than to mix the lot together. This principle is so well understood in the dressing of tin, copper and lead ores that it is difficult to understand why it should be ignored in the case of gold ores.

The loss in the residues after amalgamation and cyanide treatment at the Boulder mines varies a good deal in different mills and from day to day, and the advocates of smelting express scepticism as to the totals being always correctly confessed; but taking the figures as advanced by the various offices we shall not be above the average result of the practice on the fields if we call the loss 6s a ton on the ordinary milling grades of ore. On the richer grades, however, similar to the ore sent to the smelters, the result would be impossible without at least one re-treatment of the tailings, which would cost probably 8s a ton. Supposing there to be a loss by volatilization to the extent shown by Mr. Sutherland's experiments above quoted of £1 0s 11d a ton, the total cost of milling the rich ore would be:

	£ s. d.
First treatment as per Mr. Roberts' figures.....	0 16 11.44
Re-treatment of tailings (say).....	0 8 0
Values left in tailings.....	0 6 0
Roasting loss.....	1 0 11
Total.....	2 11 10.44

As compared with £6 14s 10d a ton, costs for smelting at Fremantle.

On these figures it would seem that there is no hope for smelting even the richer ores in competition with local roasting and milling treatment, and it would appear that to send them to Fremantle Smelting Works is an absolute throwing away of over £4 10s a ton. The items roasting loss, values left in tailings, and cost of re-treatment of tailings, are, however, all more or less doubtful, and until a careful actual trial has been made by roasting, milling and cyaniding on a thoroughly sampled large parcel of ore of the same high grade as is sent to the smelters, there will always be doubt as to the relative advantages of the two methods. It was a complete surprise to me to find that at this stage in the history of the field there could still exist any doubt on such an important matter. The inferences to be drawn from the figures are unpalatable whichever side is right, for if the milling advocates are correct, an enormous sum has been wasted in unnecessary smelting; and if the smelters are correct, the loss by volatilization, and in the residues, and the cost of treatment, must be vastly greater than are admitted. It rests with each of the managers employing the rival methods to demonstrate by incontestable facts and figures that the method he has adopted is the best one for the ore with which he has to deal.

To DETERMINE the total sulphur in iron, take two grams of the sample of iron, mixed with one gram of pure iron dust, place in a porcelain crucible and cover with a layer of one gram of iron dust. The whole is covered with a disc of filter paper, the crucible lid is put in place, and the contents roasted strongly for ten minutes by means of a blow pipe flame. When nearly cool the mass is decomposed by hydrochloric acid, and the evolved gases passed through a standard solution of cadmium chloride, which is subsequently titrated with standard iodine solution. The results obtained by this method (which occupies less than half an hour) agree closely with those obtained by slower methods.

\* Abstract Report Department of Mines, W. A.

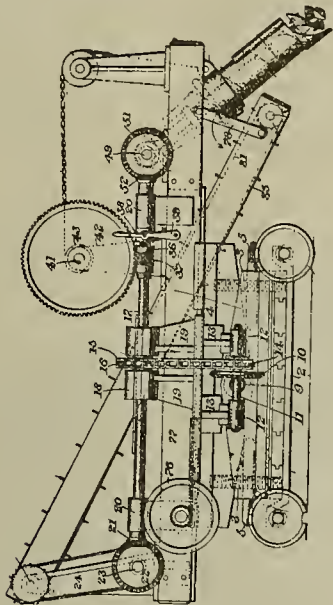


## Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 21, 1905.

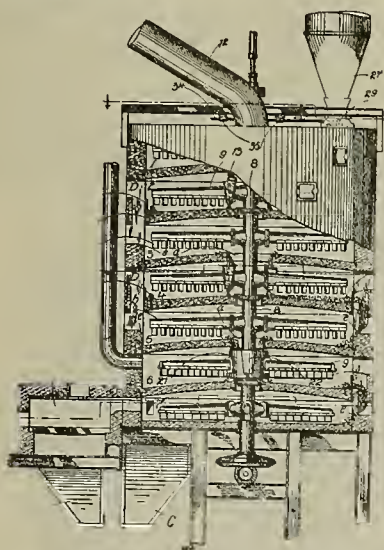
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

EXCAVATING AND DREDGING MACHINE.—No. 785,302; W. Fullard, Plainfield, N. J.



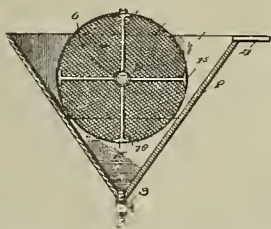
In device of character described, frame or carriage, boring tool, endless belt or conveyor, means for raising or lowering frame and means for raising or lowering boring tool and conveyor independently of frame.

ROASTING FURNACE.—No. 785,437; C. H. Repath and F. E. Marcy, New York, N. Y.



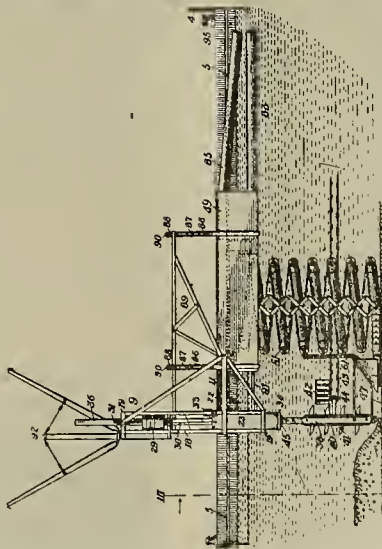
In furnace having plurality of superposed hearths, means for conducting material from one hearth to next hearth below in such manner that there is always uninterrupted body of material connecting material on one hearth with that on next adjacent hearth.

ORE CONCENTRATOR.—No. 785,531; C. G. Weller, Idaho Springs, Colo.



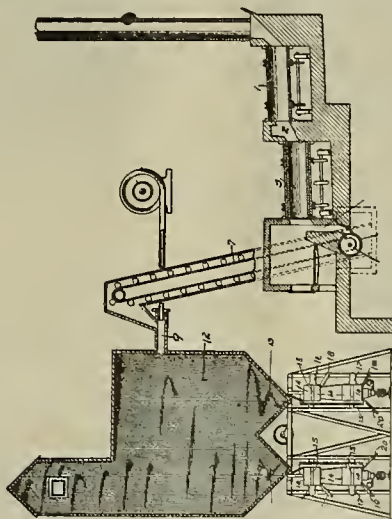
Ore concentrator, combination of box for receiving pulp, slime or material to be separated, perforated pipe journaled in box, arms projected from pipe and forming open work and supports, rotary separating screen mounted upon end supports, they being provided with grooved rims and hubs, fabric of screen extending over grooved rims and hubs, annular binders for clamping fabric to rims and to hubs, and means for feeding pulp to box externally of screen.

MINING DREDGE.—No. 785,263; A. G. Macdonell, Chevy Chase, Md.



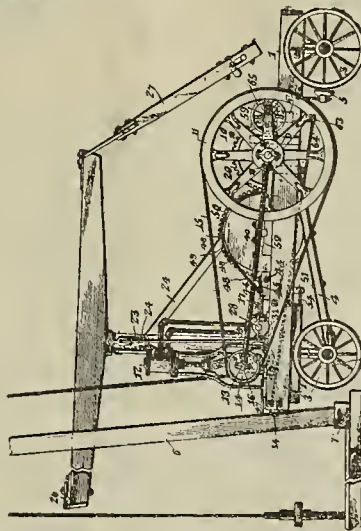
Dredge, comprising spaced floats and transverse bridge carrying rigid ladder excavator, bridge being longitudinally movable in space between floats and excavator being vertically movable on bridge, and means for moving ladder forward and thereby forcing excavator against material to be dredged.

PROCESS OF SEPARATING AND REFINING COMPLEX ORES.—No. 785,167; E. Hedburg, Joplin, Mo.



Process of treating ores, consisting in, first, drying ores; second, roasting same; third, subjecting material while heated to action of hydrocarbon gas generated by heat from roasted ore; fourth, partially cooling material, and, fifth, separating magnetic components by passing ore through magnetic fields of progressively increased strength, whereby strongly magnetic ores are attracted by lesser energized magnetic field, and slightly magnetic ores by highly energized magnetic field.

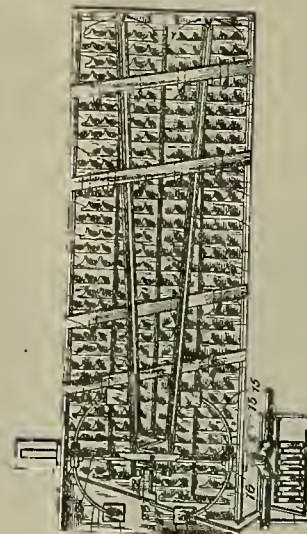
DRILLING MACHINE.—No. 785,352; R. M. Downie, Beaverfalls, Pa.



In drilling machine, combination with supporting frame, of mast or derrick located at one end of same, drive wheel supported on frame in rear of mast or

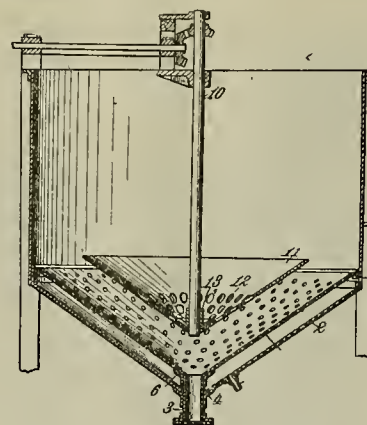
derrick, spudding mechanism mounted on frame between drive wheel and mast and including crank located in substantially same plane as drive wheel, pitman for connecting crank of spudding mechanism and drive wheel, walking beam supported on frame over spudding mechanism and having rear end above drive wheel, and another pitman for connecting drive wheel and walking beam.

AMALGAMATOR.—No. 785,565; P. McEntee, Spokane, Wash.



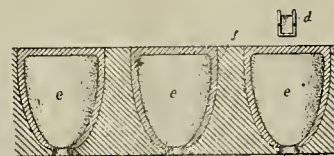
Amalgamator comprising sluice having amalgamating plates, means for feeding material to be treated, together with water and mercury, to sluice, collector into which sluice discharges, collector having means for separating water and tailings from amalgam, and free mercury from latter, and means to return recovered mercury to sluice for reuse therein.

ORE AGITATOR AND FILTER.—No. 785,522; V. A. Robinson, Florence, Colo.



Ore agitator involving receptacle having inverted cone-shaped bottom, inverted cone-shaped foraminous supplemental bottom arranged in receptacle, inverted cone-shaped perforated agitator arranged in receptacle in operative relation with respect to supplemental bottom, pipe extending and opening in receptacle above supplemental bottom, and receptacle further provided with outlet below supplemental bottom.

SULPHIDE ORE SMELTING BRICK AND PROCESS OF MAKING SAME.—No. 784,850; J. Furukawa, Tokio, Japan.



Improvement in art of smelting which consists in forming core of charging material, and casting shell of matte all around same.

PROCESS OF MAKING NITROGEN COMPOUNDS.—No. 785,161; A. Frank, Charlottenburg, and N. Caro, Berlin, Germany.

Process of producing cyanides from carbides by heating from dark red to bright yellow heat, carbide that will not melt at these temperatures, reacting upon heated carbide with nitrogen, then melting product of reaction and extracting cyanide in usual manner.



## MINING SUMMARY.

Specialty Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

The Alaska-Persoverance M. Co. has put in now machine drills at their mines at Silver Bow Basin.—Assistant Superintendent H. P. Stowe of the Alaska-Treadwell Co. expects to start work on the Alaska-Juneau sixty days in advance of the corresponding date of last year.—J. H. Conrad has brought in machinery to work the Potty silver properties on Windy Arm.—J. Singer of Sunrise, on Six-mile creek, Kenai peninsula, has ten claims on the forks of Six-mile canyon and on East Fork and expects to have the new plant in operation in July.—In the Cook's Inlet district is the \$150,000 dredging plant of the Turnagain M. Co., under the management of A. C. Carter, the plant operated by Girtwood of New York on Crow creek, and the Wichel hydraulic elevators on Canyon creek.

Frank Hammond has resumed charge of work at the mine and mill at Sheep Creek, on the mainland, 4 miles southeast of Juneau.—The Pacific Coast Gypsum Co. will develop their property on Chicago island under the direction of T. N. George of Juneau.

A pay streak has been struck on Edmonton creek, on Discovery claim, in the Stewart River district. It is 35 feet to bedrock and eight pans yielded \$1.40. Bilivieu & Guerin are the owners. The discoverers of Lead creek are prospecting the entire 1500 feet of Discovery claim. The ground proves equally good the full length. The Highest and Duncan claims are proving rich, and, when machinery is installed on Duncan creek, it may prove to be one of the richest in the Klondike.

### ARIZONA.

#### Gila County.

Superintendent W. S. Sultan of the Arizona Commercial Copper Co. of Globe has bought a new hoist for the Copper Hill mine, and cars, track and drill steel. The company has 10 claims north of the Old Dominion mine. The Copper Hill has a 600-foot shaft showing oxide and carbonate ores near surface with an 8-foot vein at the bottom of the shaft.—The Kellner gold mill in Lost Gulch has been closed on account of the continued wet weather, which has filled the several shafts on the Kellner mining property with water and caused the tunnels to cave. As soon as the weather clears the damage will be repaired and the mill will be started again.—Chas. Beck, R. H. Hammer and J. Bice have taken a bond and lease from O. S. Cross on two claims at the head of Pinto creek, adjoining the old Pasquale Negro claim, near Globe. They have started sinking a 100-foot shaft.

Development work has been resumed on the Arizona-Colorado Copper Belt & Gold M. & M. Co.'s mine, near Globe. Two shifts are working under Superintendent J. W. Banbauer, and the force is to be increased to three shifts. A crosscut is being driven from the bottom of the working shaft, 212 feet deep, to intersect the main vein believed to lie 30 to 40 feet to the north.—The Woodson tunnel of the Inspiration M. Co. has been driven 600 feet. J. D. Copper of Globe is manager.

#### Graham County.

(Special Correspondence).—The New England and Clifton Con., at Clifton, will ship from their ore reserves in the mine and also from the large dumps on the Copper King lode. The company has done most of its development work. E. R. Morse, 43 State St., Boston, Mass., is president and A. P. Ayling general manager. Clifton, March 27.

Frank Weist of Globe has taken charge of work at the Starlight mine of the Tri-Bullion S. & D. Co. in the Stanley Butte district, 8 miles south of San Carlos. The company will substitute steam power for a gasoline engine now in use. A station is being cut at 1400 feet in the main tunnel, where an upraise and drifts will be started in ore. The tunnel, which has been run 1600 feet, will be continued 150 feet farther to strike the contact.

#### Mohave County.

It is reported that the Arcadia M. Co. will resume work on its property south of Kingman on the Sandy. P. H. Smith of Windsor, Nova Scotia, president of the company, has been at the property.—The Standard G. M. Co. have started work in the Chemehuevis district, near Kingman, under the superintendence of G. W. Jonas.—It is stated that the new owners of the Elkhart mine at Chloride will put men to work.

#### Pinal County.

(Special Correspondence).—Three carloads of machinery for the new 150-ton smelting plant to be installed near Dudleyville by the Saddle Mountain M. Co., to treat the copper ores from the San Carlos group, have arrived at Florence and will be forwarded to Winkelman as soon as the Phoenix & Eastern line can be reopened for traffic to that point. The three new steel bridges to be put in between Florence and Kelvin have reached Prescott and will be forwarded as soon as possible. The company will not waste any time and material on temporary structures.

Florence, March 27.

The molybdenum possibilities in the mines of the Troy-Manhattan M. Co.'s property at Troy is being investigated and developed by C. O. Schabe, who is at the mine to construct the plant ordered.

#### Yavapai County.

R. H. Brumister, acting for the Arizona Gold Lode M. Co., has bought the holdings of the Advantage G. M. Co. in Groom creek. The 10-stamp mill will be moved to the Arizona G. M. property in Cherry creek and erected there. The Arizona Gold Lode Co. now has a large force at work in Cherry creek and has had excellent results thus far.

Superintendent G. D. E. Mortimer, of the Rincon Mines Co., operating mines  $4\frac{1}{2}$  miles east of Congress,

reports that the shaft is down 950 feet and levels have been run, but no stopping. A mill, cyanide plant and a new hoist have been put in.—The large ore bins and loading device for the Treadwell smelter at Mayor have been finished and are ready for business. These bins have a capacity of 2500 tons.

### CALIFORNIA.

#### Amador County.

J. Isola has charge of prospecting at the Bay State mine, north of Plymouth. At the Rhetta ore is being stoped by six men and treated in the 10-stamp mill of the Bay State.—On Indian creek, 1 mile north of Plymouth, F. A. Orr has been sinking in the Lane shaft. The pump is being run by an overshot wheel. The vein has very little water in it, a concrete bulkhead and clay in the bedrock keeping out the surface water from the creek.

F. Euhanks has charge of men sinking a shaft and running a tunnel on the Jose Gulch mine, southeast of Jackson. J. B. Harris is superintendent.

#### Del Norte County.

T. W. M. Draper, manager of the Monumental mine, south of Waldo, Or., will put on more men to complete the mill and other improvements. Tests will be made on the sulphide ore preparatory to putting in a plant to treat it. Machinery is hauled from Crescent City.

#### El Dorado County.

(Special Correspondence).—The Scherrer ledge at Georgetown may be worked this season.—At the Delwich drift gravel mine, 4 miles northeast of Georgetown, the Union M. & E. Co. have twenty men drifting and breasting cement gravel, which they are reducing in a Krogh mill.—The Georgia Slide diggings are being worked steadily and have produced more than the average amount of gold for the season's work. The value is found in numerous seam veins originally covered with rich placers which were worked fifty years ago. The small seams of decomposed auriferous quartz have been worked chiefly by ground sluicing and hydraulicking.

—A Georgetown company, composed of W. S. Hickman, Guy Wentworth, A. Orilli and A. Presby have brought down a 2-stamp mill from the Little Gem mine, near Josephine, and have put it on the Hanson claim directly on the line of strike south of the Georgia Slide claims, where the seams are more numerous and massive. They propose milling across the formation which here is nearly 150 feet wide, and is said to prospect well. Mining operations for many thousand tons will be of the open quarry style above the level of the car track to the mill.—McDougal, Chisholm & Co. of Georgetown have a lease on the Cranes Gulch claim and are preparing to sink deeper on the seam in the contact of the Mariposa States and Amphibolite, which has in past workings produced some good ore.—Superintendent W. E. Everson has put in two 60 H. P. boilers and a sinking pump at the Woodside-Eureka at Georgetown, and has prepared the hoisting plant for rapid work. The boilers and pipes have been covered with asbestos worked up from the company's mines near Georgetown. Georgetown, March 28.

C. Schulze of Coloma says that the Schulze & Patrick mine on Mt. Murphy is doing well and that they will put a small mill on the property.—The new hoist of the Larkin mine, near Diamond Springs, has been completed, and the shaft is being retimbered preparatory to sinking 200 feet deeper.

At the Last Chance mine, near Nashville, Superintendent J. O'Brien, of Plymouth, is opening up a good ledge. It is reported that a mill may be built on the property.

#### Mono County.

C. A. Fohrman of Bishop, general manager of the Casa Diablo, 22 miles north of Bishop, will build a 20-ton stamp mill and a 50-ton cyanide plant this year.

#### Placer County.

Work has been resumed at the Full Moon mine, near Michigan Bluff, by Superintendent G. Smith.—L. C. Trent has charge of the Dairy Farm mine, near Lincoln, an interest in which is reported sold to Du Pont-Nemours Powder Co. of New Jersey. This is a copper property at which attempts have been made to cyanide the gossan.—The Aelia M. Co., at Blue Canyon, is running a 400-foot tunnel and will upraise to strike the main channel.—Gravel has been struck at the Strawberry mine, at Monona Flat, near Iowa Hill. J. Watts, Sr., is the principal owner.

#### Shasta County.

Work is to be resumed on the Pawnee group on Wildcat creek, 3 miles from Bear Valley station, by J. T. Weeks of De Lamar (Winthrop P. O.).

The 175-ton smelter built by the Groat Western Gold Co. at Ingot, the new smelter town on North Cow creek,  $1\frac{1}{2}$  mile below the company's Afterthought mine, has been blown in.

#### Trinity County.

The 10-stamp mill at the Brown Bear mine, at Deadwood, has been started and is crushing ore supplied by the leasers. F. P. Satterlee has charge.—J. Betham, general manager of the Lappin mine at Deadwood, reports work progressing as fast as can be expected on the lower tunnel, which will tap the ledge at a much greater depth than the present tunnel and shaft. The opening of this level will enable them to keep the mill running steadily on good ore. The management expects to have an air compressor put in and then machine drills will be used. It is expected that the tunnel will be completed by July 1st.

#### Tuolumne County.

At the Horse Shoe Bend mine, near Columbia, a night shift has been put on in the 90-foot shaft, where the vein is increasing in value. Assays run from \$8 to \$80. In the Englewood tunnel four drills are being operated and the vein keeps up in size and quality. Another compressor is soon to be put in.—The recent strike in the Denmore mine, on the Stanislaus, near Columbia, owned by a Sonora company, is said to be as extensive and rich as any ever made by the former operators.—The Little Bonanza pocket mine, near Sonora, yielded a few thousand dollars recently. Indications for another strike are said to be encouraging.—The Brindle Pup

mine, between Vine Spring and the Doyle Ranch, has been equipped with a 4-foot Huntington mill.—The four claims, known as the Last Chance, Free Gold, Chas. Haley and Wilbur, contiguous properties a few miles east of Jacksonville, have been handed to E. L. Flower and J. B. Watson, who say they will develop the claims.—Several tons of ore were put through the Hope mill this week at Sonora.—Preparations are being made to resume operations at the Basin mine, north of the town of Tuolumne, which for a long time was involved in litigation. The mine is east of the North Fork of Tuolumne river.—J. Gibbs and W. Symons of Sonora have a bond on a claim recently located by G. F. Copeland, situated 8 miles from Tuolumne, on the North Fork of the Tuolumne river. There are three parallel veins on the claim, which have been traced the full length of the claim and are of good size, and carry free gold in paying quantities on the surface.—Articles of incorporation of the Eagle Bluff G. M. Co. have been filed with the Secretary of State: President and general manager, F. M. Meigs; vice-president, D. M. Garner; secretary and treasurer, A. Hughes; directors, G. S. Berry and E. W. McCutcheon. Meigs and Garner will look after the work at the mine, near Groveland, and it is reported will put a mill on the mine.—F. F. Werner of Oakland, Cal., and G. C. Rawson, C. Sonningsen and C. Crimin of San Francisco, Cal., have gone to the Jawhouse country, southeast of Groveland, with all the tools necessary for a prospecting camp, and provisions for three months. Mr. Werner has a hoist on the claim there. He intends to resume active operations when the weather permits. The others will open up new ground in the vicinity.

### COLORADO.

(Special Correspondence).—A plan has been placed on foot by the directors of the American Mining Congress, which held a meeting in this city a few days ago, to erect a handsome and commodious building at this point, where the offices of the Association will be permanently located, together with a large mineral display. A number of prominent mining men and operators, who have not allied themselves with the Association heretofore, are in favor of the project. At the meeting recently held here a number of questions pertaining to the needs of the Congress and the industry it represents were discussed. The next national convention will be held in El Paso, Texas, Nov. 14, 1905.

On the strength of the passage of the eight-hour law, the Western Federation of Miners have declared the strike which was started two years ago at the smelters at an end. They claim to have won a victory on account of the passage of the eight-hour law. It is believed a test case will be made and taken to the Supreme Court for an opinion as to whether the law is constitutional or not.

The bill appropriating \$125,000 to establish an independent oil refinery in the State does not seem to meet with ready adoption by the Legislature. The independent operators of the State are very aggressive in trying to get the measure adopted, as it means much to them.

The suit now on trial in the District Court of J. B. Hindry against the smelter trust for damages to his property promises to be long drawn out. The smelter people have introduced testimony to prove that the failure of crops on the Hindry ranch is due to lack of water for irrigation purposes, rather than on account of smoke and poisonous fumes from the smelter. The testimony would indicate that other ranchmen in the vicinity of the smelter do not find any trouble in raising good crops. The past few years Hindry, according to witnesses, has failed to irrigate his place as it should be to insure a good production.

Prospectors are turning their attention to the Junkins Park district, in Custer county, and it is to be hoped that the new discovery will prove to be a permanent thing.

Denver, March 27.

The eight-hour law has been passed by the Colorado Legislature and signed by Governor McDonald. The law as passed is as follows: "All labor of miners in underground mines, or other underground working, and labor directly attending blast furnaces, either in smelters or in ore reduction works, indirectly attending stamp mills, chlorination or cyanide processes and directly attending smelting furnaces producing metal or matte, which labor is in contact with noxious fumes, gases or vapors, is hereby declared dangerous and injurious to health, life and limb; and the period of employment for all persons so employed in underground mines or other underground working, attending blast furnaces either in smelters or ore reduction works, in stamp mills, in chlorination and cyanide mills, and attending smelting furnaces producing metal or matte, shall be eight hours per day, except in cases of emergency where life or property is in imminent danger. Every person, body, corporation, manager, agent, superintendent, employer, president or director shall, in every case of such emergency, make to the commissioner of the bureau of labor statistics, within ten days after the commencement of such emergency, a report, according to the form which may be prescribed by him, verified by the oath or affirmation of such person, employer, agent, manager, superintendent, president or director; each report shall exhibit in detail the circumstances creating such emergency. Any violation of this Act shall constitute a misdemeanor and he punished by a fine of not less than \$50 nor exceeding \$300."

#### Clear Creek County.

The Anglo-Saxon M. & D. Co. will build a 100-ton concentration and reduction mill and cyanide plant on the Saxon Extension property on Saxon mountain, near Georgetown. The 800-foot tramway from the mine is nearly finished.—On Democrat mountain, near Georgetown, the Red Oak is being worked successfully by leasers, including A. Roberts, A. J. Olsen, J. Jones & Co. and Teagarden & Mauff.—The tunnel of the Silver Leaf on McClelland mountain, near Georgetown, has been driven 270 feet, and Manager B. Mantelore of Idaho Springs has given a contract for 300 feet more.—J. J. White will place machinery at the Headlight shaft of the American Sisters mine, near Georgetown, preparatory to sinking.—Machine drills have been put in the



Capital Prize tunnel being driven into Griffith mountain. — The Woodstock property in the Atlantic mining district will resume in the spring under the management of J. S. Fisher. A shaft has been sunk 60 feet on the vein.

An electric motor of 150 H. P. has been ordered for the Gem shaft at Idaho Springs, which will be used to operate the new Rand cross-compound 10-drill air compressor. All air columns in underground workings of the Gem properties will be enlarged and overhauled during the next few weeks. The work is made necessary on account of the extensive operations planned for the coming year. The company has a steam and a water power electric generating plants, as well as the water power and steam compressor plant at the Silver Age station, from which the compressed air is piped over the mountain nearly 2 miles to the workings. Work has been started in driving the fourteenth level west from the Gem shaft, and the other lower levels will be started as soon as conditions will permit.

The Wilcox tunnel in East Argentine district is tapping large streams of water as well as veins of ore, and work had to be stopped for a time because of the large flow of water encountered. It is thought that the heading of the tunnel is near the Santiago lode where it extends into the Waldorf Co.'s ground, and that a great deal of the water is coming from that lode. The Santiago workings have been drained by the tunnel, which cuts the vein about 700 feet deeper than the present workings on the Santiago holdings, which lie west of the Waldorf holdings. The Wilcox tunnel is in 4000 feet. The Tobin tunnel, above the Wilcox, has cut many ore veins which were large producers from the surface workings and show good streaks of mineral where cut by the tunnel. This tunnel is being driven to connect with the ninth level of the Stevens property on the opposite side of the mountain, which it is expected to reach within a few months. Both of these tunnels are provided with power plants.

#### Fremont County.

The Dorcas M., M. & D. Co., operating in Florence, will enlarge its cyanide plant by adding three barrels and an extra hopper to the present equipment. These will increase the capacity of the plant 25%. Excavation work for the foundation is under way.

#### Gilpin County.

The Rocky Mountain Terror mine in Russell district will be worked by the Russell Gulch M. & D. Co., of which G. K. Kimball, Jr., manager of the Old Town mine, is to be president and manager. The main shaft is down 400 feet and will be cleaned out and arrangements made for the opening up of the property. S. B. Bontems, 452 Kittredge Building, Denver, Colo., is secretary and treasurer. — The Gem mine near Russell is being operated under a lease by Mellow & Co. of Russell Gulch. They have sunk the shaft 250 feet. They have commenced drifting at the bottom on both sides of the shaft and are also stoping at the 200-foot level. Hoisting is being done with a whim, but if deeper operations are found necessary, machinery will be put in. The property is owned by St. Louis, Mo., parties for whom E. W. Davis, Central City, is agent. — At the Prompt Pay mine in Russell district the shaft will be sunk 100 feet from the 175-foot level and a crosscut will be driven to the north to cut another vein on that side of the property. The Prompt Pay M. & M. Co. are working the property. E. O. Williams is in charge. — It is reported that the Delmonico property, on the south side of Quartz hill and at the head of Leavenworth gulch, is to be re-operated under the superintendency of E. Stefan. The shaft is down 1300 feet. The mill will be started.

#### Gunnison County.

Work is going on on the Grand Prize group, near Pitkin, under the supervision of W. Friend. A whim has been placed and good ore is being taken from a 15-inch vein in a drift run from the bottom of a 55-foot shaft. — The incline shaft on the Cortland is down 235 feet, with a vertical depth of 185 feet, in the bottom of which is showing a 10-inch vein of high-grade silver ore. The upper levels, from which the high-grade ore only had been taken, leaving the low grade, are being cleaned out and the dump is being enlarged with a good milling product. — The Chloride management, in the Gold Brick district, near Pitkin, has opened up some good ore in the upper workings. The pump is kept running to unwater the lower levels. — McWilliams & Jett of Pitkin have a contract to sink a 50-foot winze in the Golden Islet and are doing good work. — The Gold Links tunnel is in 1100 feet and being driven with three drill shifts of one drill each.

At the Enterprise mine, at the head of Taylor park, a 4-foot vein of pay mineral has been struck in the breast of the 4000-foot tunnel. The company will put in a mill to treat the ore. — Merriman, Cummings & Beymer will put up a mill to treat the ore from the Abe Lincoln, near Bowerman. The tunnel is in 350 feet.

#### Jefferson County.

(Special Correspondence). — The Independent Smelting Co., operating at Golden, claim to be receiving plenty of ore. It is understood the trust has again reduced their charges in order to put the Independent plant out of business. The rate has only been cut on the ores that the Independent plant is able to handle.

Golden, March 28.

#### Lake County.

Partridge & Jones of Colorado Springs will start work in April on the Lucky Joe shaft on Rock hill, Leadville. — T. J. Cash and C. H. S. Whipple are working the Triumph on Johnny hill, Leadville. — At the Fannie Rawlins, T. Kyle and partners are shipping thirty tons daily from the 400-foot level. — The Highland Mary, on the north slope of Breece hill, which has not been worked for several years, is again in commission and shipping 400 tons a month. The property is under lease to R. Shipley and E. Vernier of Leadville.

#### Ouray County.

Work has been started on the 1000-foot tunnel recently contracted by the Camp Bird people to explore the property acquired from the Imogene Basin Gold Mine Co. Aside from exploring this mineralized territory the tunnel will solve the water problem for the

Camp Bird, and is to be 7½x8 feet with a ditch in the bottom 20x20 inches for the purpose of conveying the water. — The Ouray Con. M. Co.'s tunnel near Ouray has been driven 390 feet and is making 2½ feet per day by hand. A wagon road is being constructed connecting the dump with the county road below. It is possible that power drills will be put in to expedite the tunnel. — Operations have been resumed on the Denver mine in the amphitheatre near Ouray, by the Arps Bros. — A tunnel is being driven between the Barstow and Joker Tunnel by Marion Leek to cut the Barstow vein which is believed to come through this section. The owners of the property are the Imogene Gold M. Co. The tunnel will have to be run a distance 200 feet to cut the point where the vein is supposed to be located. — The development tunnel being run by the leasers of the Black Girl, Faussone et al., is 100 feet.

#### San Miguel County.

G. Moody is working the Jim Say property, 5½ miles up Bear creek from Newmire. He has put pumping machinery in the shaft, which is down 75 feet. — F. Fortier is working in Liverman gulch, a branch of Spruce creek that empties into Bear creek, 5 miles from Newmire. He is down 75 feet in his shaft. — The Carribeau-Montezuma mines at Ophir are employing forty men and more will be added. The concentrating plant is treating forty tons of mineral daily, and shipping several carloads of concentrates each week, four to six tons of crude ore being reduced to one of concentrates. At the Carribeau mine several drifts are being extended, opening new areas of ore, and a tunnel is being driven for the purpose of draining some of the lower stopes of water. When the latter is completed operations will be facilitated, and it is probable the force will be largely increased. When the development in the mine has progressed sufficiently to warrant it, the company intends to enlarge the milling plant and make arrangements for treating 100 tons of mineral daily. — The new tunnel on the Butterfly-Terrible mines at Ophir Loop, 14 miles from Telluride, is in 600 feet, and on completion it is calculated it will be 2500 feet in length. Its purpose is to intersect the extension of the Ida vein ore shoot, from which the mill has been supplied with mineral for the past year from between the first and third levels. The tunnel will cut the shoot 750 feet below the third level, and will furnish the key to an immense body of ore. Two shifts of men with machine drills are driving it. For a while it was run on a vein, but the latter deviating from the course of the tunnel it has since been driven straight ahead through country rock. — The Butterfly 30-stamp mill is treating seventy-five tons daily, twenty of the stamps being run by steam and ten by water power, but it will not be long until the thirty, as well as the air compressor and machine drills, will be operated by water power. — At the annual meeting of the Butterfly-Terrible Gold Mining Co. in Denver, Calvin Bullock of Denver was elected president; F. J. Hobbs of Colorado Springs secretary and treasurer.

The Ouray Herald reports that preparations are being made for excavating for the foundation of the Atlas mill, part of the machinery for which is now being shipped in. It is expected to have the mill running not later than the middle of July. The mill will be capable of handling 100 tons daily, but at first only a 25-ton capacity will be installed to test the adaptation of the mill to the ore to be handled. All the arrangements of the buildings, power, etc., will be for the 100-ton capacity. The ore from the upper workings will be conveyed to the Chattahoochee tunnel by wagons, and will be transferred from there by an aerial tram to the mill, 2500 feet below. The ore body in the upper working has an average width of about 3 feet. A tunnel has been driven on the vein 1000 feet and raises made to block out the ore, of which 100,000 tons is estimated to have been blocked out, the values ranging from \$12 to \$15 to the ton. The depth attained by the upper tunnel is 500 feet. The Chattahoochee tunnel which is now being driven will cut the same vein at a depth of 1000 feet. The new drills recently installed in the last-mentioned tunnel are giving good satisfaction, and it is expected the vein will be cut within the next ten months—a distance of 2000 feet. Men are at work in the upper tunnel to block out the ore bodies and keep the development ahead of the mill.

#### Summit County.

(Special Correspondence). — The Jessie mine and mill in Gold Run gulch are working to full capacity. Several carloads of concentrates have lately been shipped, and the month of February showed a handsome profit to the leasers.

The Washington-Joliet M. & M. Co. are working away on the various parts of their large workings and keeping the 20-stamp mill pounding away, turning out a good grade of lead, gold and silver concentrates, besides the bar gold obtained from amalgamation. The Washington ledge has lately produced shipping lead ore, carrying three ounces of gold per ton. The preliminary arrangements are being made for working their placer ground this spring and summer.

The Lucky M. & M. Co. expect to start the mill next month. The Paducah claim is producing some fine milling ore as well as some of shipping grade.

The 100-ton concentrating mill of the Old Union M. & M. Co. in French gulch is about finished. The eight Wilfey concentrating tables and four slimmers are in position. The machinery starts early next month. The main tunnel is in 560 feet; crosscuts are being run. They are still in ore. The body is over 18 feet in width, with no sign of the containing walls yet at hand.

The Colorado-Wyoming Development Co. is developing, and continues to ship lead and zinc ore. They have a quantity of lower grade ore waiting treatment by milling and concentration.

The big placer companies are now arranging for active work. The North American G. D. Co. will soon be at work with their Bucyrus dredger and their plant on the Peabody placer.

The Reliance G. D. Co. expects its machinery soon. Leasers are working on the Germania mining property, with excellent results to themselves and to the owners. This property produces a high-grade silver-lead ore.

The Gold Dust Lode claim is being worked by leasers

and a good shipment is expected. Leasers are also at work in a portion of the Washington property. Foote & Hight shipped a parcel of eighty tons of zinc-iron ore from Gibson hill which gave good returns.

At Frisco the Excelsior, Mary Verna and North American are active.

Recent strikes of good ore on the Silver King, the Washington-Joliet, Laurium and other properties on Nigger hill will cause a number of good prospects in that vicinity to be worked during the coming season. The Croesus group, upon which a good amount of work has been done, is expected to resume operations shortly.

At the Laurium the main tunnel into the mountain is in 1250 feet. Three veins have been intersected, in two of which good milling ore is opened up, carrying gold and silver in lead and iron sulphides.

Breckenridge, March 25.

(Special Correspondence). — Hoyle & Hoyle, who have been leasing on the Gold Dust, Puzzle and Eighty-six claims for some time past, have organized a company capitalized at \$1,500,000, known as the Gold Dust Mines Co.; E. J. Hoyle, president and treasurer; M. W. Hoyle, secretary and manager; R. R. Kirk is one of the incorporators. The new company will continue to operate the properties above mentioned and have mapped out considerable development work which will be carried on. Some improvements in the way of machinery will be added to the property later on.

Breckenridge, March 27.

The Senator tunnel, near Breckenridge, has been run 800 feet and in the Senator vein.

#### Teller County.

The B. & M. G. M. Co., operating on the Norfolk fraction, adjoining the Jerry Johnson and W. P. H. claims, on Ironclad hill, Cripple Creek, has come into good ore in a 50-foot shaft. J. H. Hobbs, who secured a lease from the Stratton estate on the Orpha May Nos. 1 and 2, is sub-leasing, as is also Lessee Cox, who has the American Eagles. — The Irene Leasing Co. will continue the shaft of the Prince Albert on Beacon hill, Cripple Creek, from the 245 to the 385-foot level, where crosscuts will be run. Hoisting machinery has been put in. — W. P. Dunham has leased the Right-all-Right, the Finn and the Olive Branch, on Ironclad hill, Cripple Creek. — J. K. Walsh, leasing the Forest Queen, on Ironclad hill, is shipping ore. — Billerbeck & Gilbert, lessees, will put in machine drills to facilitate sinking in the Vera Beemer claim of the Banner G. M. Co., on the western slope of Beacon hill, Cripple Creek. The shaft is 86 feet deep and will be continued 50 feet farther before crosscutting. — The Sioux M. & M. Co. will start up the Sioux Falls mill on the Fluorine property, Copper mountain, near Cripple Creek, April 1. R. Blanchard, superintendent, is making an upraise from the tunnel level to the old stope or open cut, from which it is proposed to tram ore to the mill.

After an abandonment of three years, the Orpha May mine at Cripple Creek is to be operated by lessees headed by J. H. Hobbs of Colorado Springs, with David Mason as superintendent. — The Fort Pitt mine on Galena hill, near Cameron, is shipping ore from the bottom of the 500-foot incline shaft. Sinking another 100 feet will be started April 1. — The Monument mine on Battle mountain, Cripple Creek, has been sold to V. Z. Reed and associates for \$90,000. Superintendent H. Pring will sink the shaft from the 450 to the 1000-foot level.

Discovery of a valuable ore body is reported by Lessees Boyd & Herr in block No. 34 of the Anaconda estate, Cripple Creek, which is reached through the adit entering from the south slope of Gold hill. The ore body has a width of 18 inches. — The Granite G. M. Co. has sold to the Portland Co. the Baby Mine claim, which lies on the east side of the Granite claim, adjoining Portland ground. The piece of ground transferred measures 26x86 feet. — The Camilla Co. at Cripple Creek is raising its gallows frame and expects to have its large plant of machinery in place soon, when mining operations will be started. The shaft is 150 feet deep, and this will be sunk another 150 feet, when laterals from this depth will be extended in different directions. — Kenzy and associates, who recently opened up a good vein of ore at a shallow depth in the Bob Lee property on Tenderfoot hill, have the new shaft house completed and a new complete plant of machinery installed. — The greater part of the Modoc property, embracing the Ocean View (10 acres) and the K. P. Extension South (10½ acres), on Bull hill and Battle mountain, Cripple Creek, will be leased by Manager Frankenberg. That part of the property lying between the third level and the surface will be retained and operated by the Modoc Co.

## IDAHO.

#### Idaho County.

(Special Correspondence). — Idaho is experiencing a phenomenal condition for this season of the year, there being but little snow in evidence, where usually it lies deep on the mountains. "Old-timers" state that it is the greatest shortage in twenty years, and, unless we can note a rapid change in conditions, placer mining will suffer on account of lack of water in the ditches and a short season will result.

Newsome, March 26.

The Grangeville mines, near Elk City, have been secured by the Silver Giant M. Co. of Spokane, Wash., and will resume work April 1. They expect to put in a milling plant this season.

F. S. Allison has struck good ore on the Reliance group, 25 miles southeast of Roosevelt, at the head of Reardon creek, near Black Lake.

A 10-stamp mill is running on the Atlas property, Buffalo Hump, the ten stamps having succeeded the five stamps that had been in operation. This property is owned by Howell Peel, George Crane and others of Salt Lake City, Utah.

#### Shoshone County.

It is reported that Chas. Sweeney of Spokane has sold his stock in the Federal M. & S. Co. for \$2,650,000, possibly to the Guggenheim interests.

Galena and zinc ore has been struck in the Surprise group, on Pine creek, near Wardner, by W. Yetter. — A new ore shoot has been found in the Steward M. Co.'s property, on Steward gulch, near Wardner. H. F. Sam-



uels of Wallace is interested.—The Custer mine, on Nine-mile creek, is hand-jiggering ore taken out during the winter and shipping the concentrates. Machine drills are to be substituted for hand work as soon as the ore in No. 2 level has been cleaned up. The company is working ten men. The property is under bond to W. R. Swicegood of Frisco and A. Baker of Joplin, Mo.

Shipping ore has been opened up in the lower tunnel of the Stewart mine at Wardner. H. F. Samuels and associates are the owners.

#### Washington County

The Iron Springs Con. M. Co. at Iron Springs, 5 miles north of Black Lake, has ordered a 200-ton cyanide plant. Owing to the unprecedented light snowfall in the mountains this winter, the roads will be open several weeks earlier than usual, and the machinery can be taken in and the plant be in running order by next fall. D. C. Nevin is manager.

### KANSAS.

The Standard Oil Co. has discontinued giving jobbers and wholesalers in Kansas concessions in price on refined oil and gasoline. The effect of this order will be, it is said, to take the business of the handling of the kerosene away from the wholesalers, who now will have to pay the retail price for these commodities.

### MONTANA.

#### Broadwater County.

At the Park properties of the Mason syndicate, near Hassell, seventy-five men are employed and development is being pushed. The tunnel is in 1200 feet to tap the main vein. There is plenty of ore to run the 100-ton concentrator from the old workings. A postoffice, Mason, has been established, with a daily stage from Townsend.

#### Fergus County.

G. M. Nelson of St. Paul, president of the Chicago-Montana G. M. Co., which closed down its mines and mill at Whisky Gulch, March 1, owing its miners and millmen two months pay, amounting to \$15,000, has been at Gilt Edge to make an examination of the property and ascertain the exact shape in which the company's affairs stand. He hopes to start up the property again.

#### Flathead County.

The Silver Giant M. Co. of Spokane, Wash., has acquired the Big Eight mine, near Troy, and will sink the two-compartment shaft from the 160 to the 300-foot level.

#### Jefferson County.

J. Steinbrenner, developing the Carbonate Chief group in the Warm Springs district, near Clancy, has a large vein of ore from which he is shipping about 300 tons a month to the East Helena smelter.—The White Pine Co. in the same district, near the Carbonate, are taking out good ore and shipping. The property is developed by two 500-foot tunnels.

There is more activity in the mining districts around Clancy, 9 miles from Helena, than for years before, and the season promises to be an unusually busy and prosperous one.

A syndicate of Chicago, Ill., capitalists will develop the property of the Wickes-Corbin Co. at Corbin this season. Mr. Bird, who controls a number of claims in that vicinity, is making explorations with a diamond drill.

#### Lewis and Clarke County.

(Special Correspondence).—Manager F. L. Sizer, of the Whitlatch-Union mines, south of Helena, expects to be able to get into the old workings the latter part of April, as the water in them is receding rapidly owing to the drainage through the new workings, which are now below those made in former years. The new hoist installed at this mine is in successful operation and this will permit much more extensive and deeper development than was possible before. Ore is coming from the 400 level, of which twelve to fifteen cars are shipped monthly to the East Helena smelter. Another vein—the "Mac"—is known to lie below that opened and it is thought that in another 100 feet of depth this vein will be reached. A mill is contemplated, and the hoist, pumps, mill, etc., are all to be operated by electric power. The ore shipped has netted about \$700 per car. The Penobscot property remains idle, though it has much promise. The last attempt to work it was about five or six years ago, when the old workings were searched for pay ore, but little new development accomplished. The property now requires the expenditure of a considerable sum of money in vigorous development, with a view to opening up some new ore bodies. It is situated near the noted Bald Butte mine, which has been one of the best gold producers in Montana.

Helena, March 26.

A vein of copper has been struck in the property of the Brooklyn Bridge Co., 4½ miles south of Helena. The strike was made at a depth of 330 feet, and it is the intention of the company to sink 700 feet in the expectation of opening up larger bodies.

#### Madison County.

The Moonlight mine, owned by Carroll & Martin of Helena and F. L. Sizer, is making shipments, the ore averaging \$140 per ton. The owners of this property propose to do much more work in this vicinity this season than before.

The Red Bird M. Co. of Helena is developing three of their properties—the Red Bird and Copper Hill, near Austin, and the Reliance, in High Ore gulch. The shaft on the Copper Hill will be sunk another 100 feet. Ore is being taken from the old workings of the Red Bird and larger machinery will be put in to develop that property to a greater depth. On the Reliance extensive development work will be done. Shipments from all these properties have been extensive and profitable.

The Inter Ocean Co., developing a group of claims on Red mountain, at Rimini, has its tunnel in 1800 feet and has cut several veins, the last being 30 feet wide with two pay streaks, the ore running in gold, silver and lead.

The Black Hawk mine, owned by the Mason syndicate, is running steadily. New and extensive development is to be undertaken this season.

#### Missoula County.

An air compressor is to be put in at the Montana-Standard mine, 11 miles from Thompson, by J. Murphy. Water will be flumed 1½ mile from Crow creek.

Y. E. Gresslee of Baltimore, Md., secretary and treasurer of the Grangeville Quartz M. Co., is at Clinton arranging for the establishment of a smelter at Clinton. It is the idea of the company to put in a 50-ton-per-day smelter, and if the owners of the adjoining mines will agree to have their ore treated at the company's plant they will put in a 100-ton smelter.

#### Park County.

C. R. Tuttle, secretary and general manager of the New World Smelting Co., has gone to Livingston, Mont., to make arrangements for the installation of a sampler and smelting furnace at New World City which he reports having ordered. He is also making arrangements for ore deliveries.

#### Silver Bow County.

(Special Correspondence).—The Amalgamated Copper Co. produced copper during March at the rate of 650,000 pounds per day. During February the total production at the Washoe smelter exceeded 12,000,000 pounds, but during the first week of March the production averaged 428,572 pounds per day. During the first twenty-five days the Washoe output was 10,714,300 pounds. The smelter treated 7000 tons of Butte ore daily, which went over sixty-one pounds of copper to the ton. The Amalgamated Co. treats 3000 tons daily at the Boston & Montana smelter at Great Falls, and 600 tons a day at the Butte & Boston smelter at Butte. The Boston & Montana ore averages higher in values than the ores treated at the Washoe, but taking the same yield of copper per ton the total daily production of the Amalgamated Co. would reach 648,172 pounds per day, or a total for March of 20,093,332 pounds. At 15 cents the daily value of the Amalgamated output is \$97,225.70. In addition, ore yields gold, silver, arsenic, etc. The average in recent years for gold and silver was 2½ cents for each pound of copper produced, and it has been estimated that the by-products about pay for operating expenses and cost of production. The capacity of the Washoe smelter at Anaconda is being increased, and in three months it has been raised from 5500 tons of ore daily to 7000. The smelter treats daily 7000 tons of ore, 550 tons of coal, 400 tons of coke and 1500 tons of lime rock. A year ago much of the ore that is now being treated at a profit was left in the mines as waste. Since the first of the year eight roasters have been added to the plant, and the last of the old small reverberatory furnaces has been torn down, and six new ones are completed and the seventh is nearly finished. The hearths are 116 feet long, 19 feet wide. Each reverberatory handles 300 tons of ore a day. The new arsenic plant has been in operation for several weeks and will soon make shipments. The material for the arsenic plant comes from the long flue that runs from the smelter to the smokestack ½ mile from the smelter. A portion of the dust from the flue is rich in arsenic and is taken to the refinery which it leaves 99.9% pure.

Butte, March 27.

#### Yellowstone County.

J. B. Salisbury of Grand Forks, N. D., has reopened the Shafter mine and mill at Summit after a winter's inactivity. He will begin work on a deep shaft as soon as the snow is off the ground.

### NEVADA.

#### Humboldt County.

M. D. Smith, superintendent of the Golden Eagle mine at New Central, near Winnemucca, reports that some of the men have been laid off from the mine pending the enlarging of the cyanide plant. This work will take about thirty days, and it will be May 1st before a full force will be put on.—The United States Smelting Co. have shipped 395,000 pounds of fluxing iron ore from the Vulcan mine on Winnemucca mountain since March 15th. All the ore containing anything but iron is being piled on the dump for shipment later. The reason for this is that the Southern Pacific Co. gives a special rate of \$4 per ton on pure iron ore to be used for fluxing. Superintendent Nichols says all he wants is ore that will run high in iron, and all that contains any other metal is put aside for shipment later.

#### Elko County.

W. D. Higginbotham, manager of the White Rock Placer Co. at Elko, expects to resume sluicing in April.

#### Esmeralda County.

(Special Correspondence).—The Royal G. M. Co. of New York, J. D. Hoff, M. E., manager, has leased 300 by 300 feet of the Combination M. Co. of Goldfield and work started. They also own 120 acres of ground northwest from the Sandstorm, on which development work will be started.

Goldfield, March 27.

C. L. Marsh plans to ship freight from Salt Lake City, Utah, by way of the Clark road to Caliente and from there by team to Goldfield, giving the following freight rates between Salt Lake City and Goldfield: First-class freight, \$3.73; second-class freight, \$3.56; third-class freight, \$3.41; fourth-class freight, \$3.25 for each 100 pounds, and a proportionate rate to all other points in southwestern Nevada, time not to exceed twelve days from Salt Lake City to Goldfield.

L. Bleakmore, J. S. Cook and W. H. Lang of Goldfield have bought the Shoshone property of R. Montgomery at Bullfrog for \$800,000.

#### Lander County.

At Battle Mountain the Humboldt mines are being worked under a bond by L. A. Jeffs.

#### Lincoln County.

F. P. Swindler, general superintendent of the Bamberger mines and mill at De Lamar, is waiting the approval of Simon Bamberger, after which he will proceed at once with the construction of an auxiliary plant which will enable him to reduce 700 tons of gold-bearing tailings from the old mill daily, the plant as designed providing for eighteen steel leaching tanks, with twelve for the slimes.

J. Bullen and N. Dunne have sold the Mikado group,

south of the Virgin river, to McMasters, Flick & Bloom of New York City for \$7500. The new owners will put six men at work immediately taking out ore.—Lassen & Wilde of Baltimore, Md., have taken an option on the Santa Anna gold-copper claims, north of Good Springs, from Ray & McWilliams of San Diego, Cal., for \$12,000. There are twelve claims in the group on which over 500 feet of work has been done.—Norton, Gohson & McBride have taken an option on the Lost Cabin group of eight claims, 42 miles west of De Lamar, from Gillen, McWade & Leeson, for \$5000, and will put men at work.

Hansen & Wilson, leasers on the Hidden Treasure gold mines, on the upper Virgin river, report a clean-up of \$4500 for the past three months. This work was done on the old river bed, which was struck four months ago.—Gordon, Fletcher & McBride, owners of the Prospector group of gold-copper claims northwest from Moapa, have completed their ore road and expect to ship their product to Salt Lake, Utah, smelters.

It is reported that the railroad from Caliente to Pioche is to be built.—The Pioche Exploration Co., A. W. Scott of Pioche manager, have raised money to buy, equip and develop Pioche properties. They recently purchased the Mendha.

#### Lyon County.

The small quartz mill which Davidson & Lockwood have been building on Missouri Flat, near Yerington, has been completed. It will be run by water power from the Strosnider ditch and will start up the first of April. Ore from the Davidson & Lockwood mine, in Crabb district, will be worked in this mill, and custom work will be done.

#### Nye County.

The Four West Gold M. Co. has been formed at Tonopah with J. Douglas, president; W. J. Landers, vice-president, and M. R. Averill, secretary. It is the intention to sink a shaft.—J. Harris has charge of work for the Gold & Copper M. Co. at Tonopah.—Manager Wynkoop of the Liberty M. Co. says the plans for the 20-stamp mill have been drawn and he is now awaiting instructions from the home office, Philadelphia, to go ahead with its construction.

#### Washoe County.

J. Burke of Reno has leased the White Limestone mine in the Virginia range, 10 miles southeast of Reno, to the California Cement Co. for five years. Work is to commence immediately, and twenty miners and ten teams will begin operations. The White Limestone is a gypsum and quicksilver proposition. The rock is to be used in making Portland cement, plaster of paris and other materials.

### OREGON.

#### Baker County.

(Special Correspondence).—A carload of concentrates has been shipped to the Sumpter smelter from the concentrating plant at the Highland mine by N. J. Sorenson & Co. At this plant coarse concentration is desired. The Highland ores are sulphides. The ore crushed to ¼-inch size goes to a trommel screen, the first section of 20-mesh screening out the fines, which, conveyed by launders, go to the Card concentrating table which separates the values and makes the table concentrates. All material going through the remaining section of the trommel screen goes to the fine jig for jiggling treatment and comes out in three grades of concentrates: Head sieve fine concentrates, tail sieve fine concentrates, and hutch. The oversize, or all material that will not pass through the trommel screen, is led to the coarse jig, which also makes three products of coarse concentrates, namely, from the head and tail sieves and hutch. In these jigs the values settle on the screens, from which they are tapped off by an automatic spout. About 3000 tons of milling ore on the dump at the mouth of the Glasco tunnel is being run through as a test of the new plant's capacity. This ore dump was hanked up during the development of the Glasco drift and the shipping of ore while the concentrating plant was being installed. Some good assays have been had on concentrates produced from this ore dump. From six to eight tons of crude ore are concentrated into one by the process and from 50 to 75 tons per day are run through, varying with the character of the ores. The company have under consideration the installation of a 200-ton concentrating plant. The drift on the vein is in 1000 feet, the Highland crosscut 350 feet into the mountain. The drift on the vein is called the Glasco tunnel; some ore bodies have been opened up. The Highland crosscut is intended to provide the main entrance or outlet for the working and developing of the mine, and will intersect the main vein 200 feet below the level of the Glasco tunnel. It will reach a depth of 800 feet on the Bannockburn claim. At the mouth of this tunnel is to be erected the large concentrating plant soon to be placed on the property.

Sumpter, March 28.

Manager H. C. Armstrong of the Chloride mine in the Elkhorn district, near Baker City, has secured a lease and bond on the Chloride mine from the stockholders and directors and will begin development work. The bond calls for the building of a stamp mill.—G. W. Boggs of Baker City, manager of the Mayflower mine near Cornucopia, has received notice of a rich strike at the mine from Superintendent J. A. Wilson.—A. J. Ernest of Seattle, Wash., intends to begin work on the Virginia mine, near Greenhorn, by May 1. The shaft will be sunk another 100 feet before the mill is started.

The first shipment of ore from the Indiana mine, 20 miles northeast of Baker City, has been received at the Sumpter smelter. Manager J. W. Messner is driving the 100 and 200 levels. The shaft is down 275 feet. When the 300 level is reached another station will be cut out and a third drift extended on the vein.—The Bonanza mine at Geiser is to be worked by A. Geiser under a bond and lease.

The Psyche mine at Greenhorn is shipping enough ore to the Snow Creek mill to run it one shift. Owing to the spring break up, the roads are in poor condition, or the mill could be kept running night and day. A large quantity of ore is broken and stored in the mine. The Psyche has a 20-stamp mill, but no wood cut for fuel. As soon as spring opens the mill will be put in shape,



and it is expected that enough ore will be in sight to keep it running. The Snow Creek shaft is completed 100 feet below the tunnel level, making it 225 feet deep. A crosscut is being run from the bottom of the shaft to cut the ledge. A few men are stopping ore from above the tunnel level, the greater part of which is being shipped to the Sumpter smelter.—The Royal White is being operated by lessees and they are taking out some good ore from a winze below the tunnel, which they will work at the Black Hawk mine.—Gilke & Kershaw have begun piping on their Vinson creek placers.—This is the earliest by six weeks that placer mining has ever been done in the vicinity.

#### Grant County.

It is reported that W. E. Gifford of Prairie City may put in a stamp mill on the Present Need, which he is working under a lease and bond.

G. T. Smith has bonded the Gem mine, near Susanville, and has an option on the Smyres ditch and water right.—The Stockton mine is worked very little owing to litigation with the Badger Co., who claim a half interest in the property. The Badger Co. is now sinking its shaft to the 900-foot level. At the 700-foot level the ore was shipped without being concentrated. The mill is being run full force day and night. The property is in charge of E. P. Kennedy.

#### Jackson County.

The showing made by recent retorts of ores from the cinnabar mines of the Meadows quicksilver district, near Trail, has caused a revival of interests in the mining of mercury in this section. Eighty pounds of mercury to the ton is produced by the properties of the Rogue River Quicksilver M. Co. The ore reduces easily and is uniform in value. This mine has produced considerable quicksilver in recent years, but its development has been slow. A small plant is placed for development purposes mainly. The retort has a capacity of 1400 pounds of ore per day. The mine is opened to a depth of 200 feet.

A new camp called Gold Ridge is attracting attention. It is on the north slope of the Siskiyou, on upper Sucker creek, at an elevation of 3000 feet. H. Siskron made the first discoveries.—In the Canyon Creek district, near Medford, Manager Layman of the Lewis & Clark M. Co. is running an 1100-foot tunnel to tap the main ore body. He will put in an air compressor and machine drills this season, and plans to cyanide the ore.—One of the few southern Oregon hydraulic mines that has been supplied with water for continual operation this season is the Sterling near Medford, the property of L. Ankeny and N. Cook of Portland. F. E. Ankeny of Jacksonville is superintendent. It is believed that the output of the Sterling for the present season, despite the absence of rain, will be \$30,000.

#### Josephine County.

Manager C. R. Ray of the Condor Water & Power Co. at Gold Ray says that the 2000 H. P. plant is to be increased to 3200 H. P. The dam across Rogue river raises the stream until its entire volume is given a drop of 22 feet.

S. Chase, owner of the Oro Fino mine on Jump-Off Joe creek, near Grants Pass, reports that he will build a 50-ton cyanide plant at the mine this season.

The Rand Mining Co. has just completed a large reservoir, to store water for the company's placers, near Galice, which have been in operation since November. With the new reservoir they will have water to supply the giants until June.

### UTAH.

#### Beaver County.

Manager Rohlfing has put in a gasoline hoist to expedite work on a crosscut being driven on the Lulu at Frisco to cut the Horn Silver ledge.—L. Morrison is reopening the Indian Queen, near Frisco.

It is reported that work has been resumed at the Blue Bird mine at Milford, owned by E. W. Genter of Salt Lake City.

#### Juab County.

For week ending March 24 fifteen Tintic mines sent out 167 carloads of ore, about 5845 tons. The force at the Centennial-Eureka mine has been increased to 325 men. The list of shippers and number of cars sent out by each is as follows: Ajax 3, Bullion-Beck 6, Centennial-Eureka 91, Carlisa 1, Eagle and Blue Bell 7, Gemini 15, Grand Central 7, Lower Mammoth 1, Marlow-Baxter lease 1, Mammoth 13, May Day 5, Swansea 2, Uncle Sam Consolidated 3, Victor Consolidated 3, Yankee Consolidated 9.

J. C. Sullivan of the Victoria mine, at Eureka, says that a winze is being sunk from the 800-foot level and that a raise is being made from the 900-foot level. The 800-foot level on the Grand Central, through which the Victoria is being worked, is an intermediate level and consequently the management of the former property is anxious to get an opening through to the 900 level, as this will expedite development work and open up stopping ground. The last shipment from the Victoria was six loads. There is plenty of room for the storing of the ore underground and consequently it is not sent out until several carloads have accumulated. C. E. Loose is manager.—Work has been resumed by the Dakota M. Co., near Diamond. The company may buy the hoisting plant of the old Cleopatra mine at Silver City, and sink 200 feet farther. James Higginson of Eureka is in charge.—The Sweetwater mine in North Tintic will begin development.

#### Piute County.

General Manager S. M. Levy of the Annie Laurie mine of Kimberly reports the completion of the 450-foot upraise connecting the lower with the upper tunnel. When the timbering is completed all ores mined will be sent to the mill through the lower adit.

#### Salt Lake County.

Alex. Colbath, manager of the Quincy M. Co. at Alta, reports that a good body of lead ore, carrying silver and gold values, has been struck in the tunnel 1370 feet from the mouth.

The Columbus mine, at Alta, has started to cut a station on the first level below the tunnel, and, as soon as completed, will drift both ways. They have a large body of ore at this point and will have a good stoep to the tunnel level. The mill is running steadily, both

shifts. The bins are full of concentrates awaiting shipment, the roads being in such bad condition that teaming is almost impossible.—The Continental tramway has ordered more buckets, as the present number is not sufficient to work it.

After the roof of the Kempton mill at Bingham has been raised it will be started on ore from the Phoenix and from the Silver Shield.—At the Boston Consolidated at Bingham the forces have been doubled. The ore shipments have been increased from 150 to 250 tons daily and could be further increased were the smelter prepared to handle more. The Teck tunnel, which is exploring the porphyry belt, is going ahead at the rate of 37 feet per week, and the rock thus far has averaged from 1.07% to 2% copper. The Boston Consolidated has made arrangements to furnish air to the Bingham Central.—The Fortuna company has struck good copper ore in the Keystone tunnel, which has been driven on the Keystone contact 2200 feet. Superintendent J. Start is putting out twenty-five tons of lead ore daily from another vein to which it will now add shipments of high-grade copper ore. The Fortuna company has contracted with the United States smelter under which the latter secures the entire output of the mine for three years.

It is said that J. C. Montgomery of Denver has an extension of time on his option on the Ohio Copper Co.'s property at Bingham, and will continue development work.

The Utah Con. Copper Co. at Bingham is contemplating increasing the capacity of its smelter 500 tons. Its present smelter is treating 825 tons of ore per day and turning out copper bullion at the rate of 1,500,000 pounds per month. An increase of 500 tons in smelter capacity would permit the treatment of a still larger percentage of low-grade ore, and of a monthly bullion output of 2,000,000 pounds.

#### San Juan County.

A. E. J. Weyland of Spokane is in the San Juan River country, where the Great Western Oil Co., in which he is interested, owns 3600 acres of oil land. Superintendent B. D. Harshberger expects to begin sinking five wells on June 1. The company has made a contract to supply fuel oil to a New York company having placer beds in the district.

#### Sevier County.

The Copper Butte M. Co. of Richfield has contracted with W. J. Shelton for an additional 100 feet of opening in the Shelton No. 2 tunnel. This tunnel is in over 100 feet. A 50-foot shaft has been sunk. It is expected to strike a cross vein within the next 100 feet to be run at a depth of 140 feet from its exposure in the shaft.—The Perju-Surprise Co. will resume work on its properties near Richfield.

#### Summit County.

The Mt. Masomi tunnel at Park City is in 800 feet and estimated to be within 75 feet of the cross fissure. J. C. Hasson is foreman.—J. W. White has been in Park City figuring on a hoisting plant for the Nelson property in the Elkhorn district. The hoist is to have a capacity for 1000 feet.

The annual report of the Daly-Judge M. Co. at Park City shows that receipts from the sales of ore and the placing of bonds amounted to \$174,242.74. The territory has produced 14,485,411 pounds of lead, 487,879 ounces of silver and 1010 ounces of gold since first worked. Concluding his report to the shareholders, President J. J. Daly says that, in the work, about 6000 tons of good concentrating ore, besides some first-class or shipping grade, has been taken out and stored near the mill. The character of the ore found has changed for the better from that left in the old workings, from a standpoint of concentrating as well as smelting, it being practically free from zinc and carrying a good per cent of lead, silver, gold and iron values. It is the intention of the management to continue driving the prospecting levels ahead for some time yet, as they feel confident of finding one or more of those large, rich shoots of ore, such as are found in adjoining mines. During the year tests were made, in different works, on both the crude ore from the mine as well as the zinc middlings from the dumps, to find out the best method for their treatment. The work done has been principally on the 1200 and 1400 levels. The drifts have been run ahead into virgin ground, on the different levels with some crosscut work, for 5500 feet, and while this work has not as yet opened into as large ore bodies, it has passed through many small shoots or bodies of ore.

#### Tooele County.

The Overland mine at Sunshine has shut down, due, it is said, to the collapse of the 1400-foot incline shaft, through which the property had been operated. The mine has been in charge of E. W. Clark, manager of the Ophir Hill mine at Opbir.

The Honerine mill at Stockton is reducing 300 tons of tailings daily from an old dump. While the gross value of the material does not exceed \$6 in silver, lead and gold, said Manager W. F. Snyder, the simplicity with which they are handled and the few men required in the operation of the tables and Huntington's enables the company to work them at a profit, while keeping the machinery in continuous operation. The drain tunnel is in 7500 feet.

#### Utah County.

The officers of the Gold Blossom property in North Tintic have decided to double the working force and run two shifts, also to commence the shipping of ore. The first ore is expected to be on the market within two weeks. A short road to the mine will be built to enable teams to get to the mine with supplies and return with ore for the San Pedro Railway in Cedar valley.

### WASHINGTON.

#### Ferry County.

S. G. Dewsnap of Republic says he found that by grinding the Republic ores to 60 and 70 mesh, careful concentration will produce one ton of concentrates from 35 to 36 tons of ore, this one ton of concentrates carrying from 60% to 66% of the value. By carefully classifying, 90% of the tailings from the concentration can be cyanided by percolation with a very dilute cyanide solution operating through a long time, 70% to 86% of the gold remaining in the sands after concentration can be

extracted. The slimes can be briquetted with the concentrates and make a product desirable to the smelter. The cost of such treatment, if carried on a sufficiently large scale, can be brought within \$2.15 per ton of ore. While these experiments point to a possible method of ore treatment, enough work has not yet been done to carry out all the necessary details.—The Ben Hur is taking out ore for shipment to the Boundary Falls smelter. It is reported that they have a year's contract for four cars a week.—The Quilp is shipping ore.—The Morning Glory is under lease and recently a body of very high-grade ore was struck, which is being taken out for shipment.—The California is being retimbered and put in shape as rapidly as possible for further prospecting. Superintendent Case is hopeful that he may make the California a regular shipper in time.—The greatest activity of the district is on Belcher mountain, 7 miles east of Curlew lake and 12 miles from Republic. The Belcher has been developed by three tunnels cutting the ledge to a depth of 300 feet with crosscuts showing the width of the ledge to be from 70 to 80 feet. The ore is of low grade, carrying gold and silver but high in iron. On the surface the ledge is hematite for a depth of 40 or 50 feet. Then it changes to magnetite for a limited distance and then changes to pyrrhotite and pyrites. The ore carries copper from the surface, but in the lower levels some bodies of quite high-grade copper ore have been encountered.—The Gold King and Anonymous expect to begin development very soon.—The Copper Key has been shipping ore to the Granby smelter.

#### Okanogan County.

The Ben Harrison mine at Chesaw has been closed down until J. P. Blaine and W. C. Peay, superintendent and manager, return from the East.—J. Boyd, manager of the Palmer Mountain Tunnel G. M. Co., accompanied by L. H. Porter, Northampton, Mass.; E. E. Barr, Springfield, Mass.; F. G. Dunham, Holyoke, Mass., and E. W. Mudler, Cleveland, O., has been investigating the tunnel and electric power developments of the company at Loomis.

### WYOMING.

#### Carbon County.

At the head of Spring, Jack and the Savory creek sections of the Encampment mining district, the winter has been favorable and free from snow up to the last four weeks.

J. Smith is working a copper prospect at the foot of Dexter Peak. Native copper has been found in the schist, which is an unusual occurrence in this country. The development work consists of an incline run in at the foot of the hill. He states that it will be impossible to work much longer without a pumping and hoisting plant, and preliminary steps are being taken to secure one.—The Copper Bar on Spring creek has put in a machine drill.—Underwood & Walch and Sowder brothers are working the Bridger mine on top of the Continental Divide. This property is owned by J. W. Heather of Saratoga. The shaft has been pumped out, but will have to be retimbered.

### FOREIGN.

#### BRITISH COLUMBIA.

#### Lardeau District.

Nelson reports say that work has been suspended upon the Silver Cup, because of the nearing danger of snowslides; the Beatrice has been rawbiding, but the trail is growing worse; the Eva and the Nettie L. are working as usual, while operations have been resumed upon the Silver Dollar, where a tunnel has been started to tap the lead at a depth of 100 feet. Work will start upon the Mammoth as soon as the snow goes.

In describing the mines of the Lardeau, the Rossland Miner says that the Grand Solo group, on which a short bond has been given to Eastern parties, consists of the Grand Solo and Copper Peak mineral claims, which have an elevation of 4500 to 6500 feet. So far 55 feet of tunnel has been driven on the ledge, which is 4 feet wide and shows a paystreak of 22 inches of quartz and grey copper. The property is owned by P. A. Lindgren and N. Boden.—The Black Jack, Silver Dollar fraction, Clara and Grand Falls constitute the Black Jack group. A very strong quartz lead is exposed on the Black Jack, which is 10 feet wide and carries grey copper. The only work done on this claim consists in stripping the ledge for several feet. On the Silver Dollar fraction open cuts have been made and a tunnel driven for 25 feet. In the tunnel 6 inches of ore, running 210 ounces in silver to the ton, has been obtained.—The Knob Hill group is made up of the Knob Hill, Selkirk and Valley mineral claims, and adjoins the Linson View on the south, and on it are exposed the same leads at various points. Very little work has been done on this property, which is owned by N. Erickson.—Next is the Broken Hill group, made up of the Broken Hill and Selma. On these properties is a strong quartz lead 5 feet in width, with a paystreak of from 6 to 12 inches. The ore is galena. The vein has been stripped in several places. M. Nelson is the owner.—The Red Hill group consists of the Red Hill, Broker and Victoria. On the Red Hill there is an inclined shaft 25 feet. The ore is of the same grade as the Linson View. There is an 8-inch pay streak on the hanging wall, which will average \$100 to the ton. The owners of this group are Bergh, Bodin, Craig & Hillman.—The Ruby Silver group, situate at the head of Canyon creek, consists of five claims. On the No. 1 vein of the Ruby Silver a tunnel has been driven for 25 feet, showing 25 inches of ore on the foot wall. On the No. 2 a tunnel has been run for 110 feet. On the Good Shot claim of this group is an open cut for 10 feet. The property is owned by P. A. Lindgren, M. Nelson, G. Bergh and N. Boden.—It is expected that operations on the Lake, between the ports of Gerrard and Trout Lake, will be resumed about the first of April.

#### Southeast Kootenay District.

According to the Prospector, the prospects for mining in the Fort Steele mining district look better this season than any year in the history of the district. With the three big mines in the district in operation the output of silver-lead ore will be large.—The condition of mining



in the Kootenay valley will depend upon adequate means of transportation. As soon as it is officially announced that the Kootenay Central is under construction, a number of properties will commence preparatory work toward making shipments. The snow has gone, and placer companies on Wild Horse creek are cleaning out ditches and flumes preparatory to active operations. In this district properties that usually commence work in May will be in full blast before April 15th.—Manager G. E. Henderson, of the Bull River M. Co., will increase the force at Bull River. The machinery will be put in as fast as possible.

#### Slocan District.

High-grade silver ore has been struck in the Fisher Maiden, 7 miles above Silverton, on Four Mile creek, and is being sacked until it can be shipped, as the roads are now impassable.

#### MEXICO.

##### Durango.

Bernard MacDonald, formerly manager of the Le Roi at Rosslund, B. C., now consulting engineer for the Guanajuato M. Co. of Guanajuato, says that the property is producing \$135,000 a month, of which nine-tenths is silver and one-tenth gold. The property has a big stamp mill equipment and a cyanide plant is being put in. The mine work is done by natives, who are paid \$1 Mexican, or 50 cents gold, per day. These fellows do about half the work of a good American miner, and it is fair to say that mining, so far as common labor is concerned, costs about 30% or 35% of the pay in the Northwest.

J. W. Morehouse of Guanacavi has completed plans for a 100-ton smelter and concentrator which will be built at the Nueva Australia mine. L. Judd and J. T. Judd of Mexico City, who are interested in the mines, are at the property. An attempt will be made to save the copper values.

##### Guanajuato.

E. L. Dwyer's project to drain the La Luz mines in Guanajuato by means of a tunnel and to use the resultant water for irrigation purposes has been taken over by New York and Atlantic City parties.

The Peregrino M. & M. Co. of Guanajuato has purchased a 40-stamp mill. G. H. Mellhinney is interested.—The Guanajuato River M. Co. has put in machinery to dredge the Guanajuato river. The concession under which the company will work was secured from the Government by G. W. Bryant and G. H. Mellhinney of Guanajuato. The first work will be done below the Flores hacienda, in the city of Guanajuato, where the tailings of the hacienda de beneficio, belonging to the Rul family, first entered the river. The river will then be dredged for several miles downward.

##### Jalisco.

The Zapopan G. M. Co. of Guadalajara, in which C. C. Bruckner and G. E. Purnell are interested, and which owns the Zapopan and San Miguel mines in La Yesca district, proposes to run a crosscut tunnel to cut the vein of the Zapopan mine.

##### Mexico.

President Diaz has issued a decree for the reform of the monetary system as authorized by Congress in December last. The decree establishes the "peso" or silver dollar at a value of 50 cents gold and the theoretical unit of the Mexican currency is defined to be the dollar or peso of 75 centigrams of gold.—The mint will be closed on April 16 to the free coinage of silver and the new monetary system will go into effect May 1.

##### Sonora.

(Special Correspondence).—General Manager Gerber, accompanied by Manager Lockhart and Superintendent Hyde, have arrived at Tolodo under an escort of fifty soldiers and have started the 100-ton smelter recently erected there by the Yaqui S. & M. Co. M. S. McCarthy, the former manager under Gerber, who resigned to engage in personal affairs, returned for one month to the smelter to facilitate the work of getting in shape and giving his successor the benefit of past experience regarding ores of that vicinity.—H. L. Miller, general manager of Libertad, has ordered Superintendent J. W. Cleaver to close down all work on that property. Libertad was owned by R. C. Coy and other Chicago, Ill., investors, and it was on returning from that mine that both Coy and J. McKinzie, in company with Call and Stubling, met death at the hands of Yaqui Indians, Miller and Tolletson escaping.—The Mina Grande M. Co. has completed connections by tunnel through the mountain, whereby the San Pedro and Mina Grande are in shape for operation. The mines continue to show increased valuation.—The Santa Rosa mines of San Javier are working a 30-ton smelter successfully. San Javier, March 22.

(Special Correspondence).—The Gold Treasure mine, south of Naco, Ariz., is to have a 20-stamp mill. With erection of the mill a tramway 8000 feet in length is to be built from mine to mill. The Gold Treasure is said to have 6000 tons of ore on the dump at the present time, which makes an average of \$14 to the ton. In the 700 feet of work that has been done on the property, all in tunnels, enough ore is reported in sight to insure operation of the mill for a number of years. C. H. Saunders is manager. Naco, March 26.

(Special Correspondence).—Thomas Ewing of Cananea has denounced 960 pertenencias 9 miles south of Naco. A 12-foot vein of high-grade silver ore, with 4% copper, has been struck in the Vota Grande mine.—The owners of the Cachisse silver mine, near Yzabel, report having struck an 18-inch vein of ore running 2000 ounces.—B. N. Norton, superintendent of the Swansea mine, reports that the heavy rains have seriously interfered with operations in the Picacho and Bocoachi districts.—P. D. Robles has denounced two claims of 12 and 6 pertenencias near Los Conejos, in the Bocoachi district. Cananea, March 27.

Upon representation by the Yaqui Copper Co. that marauding Yaquis were endangering their property and the lives of their employees, the Mexican War Department has established a military post at Campo Santo Nino, and sent a company of troops for protection.—The Clenaguita Copper Co., owning mining properties in

the Sahuaripa district, has ordered three additional furnaces, which are to be completed by December, 1905. Plans for a 200-ton concentrating plant are being prepared, and the concentrator should be ready about the same time. Two of these furnaces will be built adjacent to the two now nearly finished on the Chipiona group, and one at the Ostimuris mine. The object in building at the latter mine, which is about 2 miles from Chipiona, is to save the expense of hauling ore to the Chipiona smelters. Work on the Ostimuris has progressed rapidly; a large body of high-grade sulphide ore is being opened.—It is reported that the Black Mountain M. Co. is putting up a cyanide plant at Cerro Prieto. H. E. Whipple has charge.

The Transvaal Copper Co. will build a railroad from the St. Nicholas mine to Campas, 18 miles northeast, where the smelting plant is now built. The smelter will be ready for operation in six months, and by that time it is expected that the road will be completed. The new hoisting plant is in operation.

The annual report of the Lucky Tiger M. Co., working the Lucky Tiger mine in Altar district, shows that during 1904 the mines produced 1095 tons of first-class or shipping ore, having a gross value of \$236,033.28, which, added to the small production of 1903, gives a total of 1326 tons produced, of a gross value of \$269,231.20, since the opening of the mines. Development work done in 1904 was 5554 feet, making a total development of 10,358 feet since the organization of the company. On the year's production the company has a net earning of \$92,482.22. The permanent improvements made on the property were a new concentrating mill, \$141,565.11; mine improvements, \$58,050.39; various improvements, \$20,072.51. The new concentrating plant was completed and started on February 2, 1905. A test of the first-class concentrates produced showed 2.12 ounces gold and 47.1 ounces silver per ton, or a gross value of about \$320 per ton. There is ample ore of the second-class variety to keep the mill running continually, and its present capacity—fifty tons per day—can be doubled for less than one-half the original cost, which will be approximately \$60,000 when all payments are completed. A plant for treating the mill tailings by the cyanide process is now in contemplation and will probably be installed within a few months. A small smelter will also probably be built as soon as the operations of the concentrator show what process of smelting will be most advantageous. In the meantime all first-class ore will be sold and shipped as heretofore.

#### NEW ZEALAND.

The most productive mining district in New Zealand is that in Ohinemuri county, where the mines at Waiki and Karangahake are the chief producers. The mines and mills of the Waiki Co. are among the largest in the world. The annual report of the Minister of Mines for New Zealand states that 1100 people are employed by this company, which treats over 200,000 tons of ore annually for an output exceeding \$3,000,000, an average of about \$15 per ton. New ground has been opened in the vicinity which promises to materially increase the output of the district. The Karangahake district employs 450 men and produces about \$1,000,000. There is considerable prospecting being done in the district. The mines in Coromandel county are of a different class from those above referred to. The veins are smaller and the values spotted (pockets), but the output from these mines in the aggregate is large. The number of dredgers operating in the West Coast, Otago and Southland is over 200. Dredging has been carried on in these districts for many years. The Minister of Mines says that during the early period of dredging on the alluvial flats in Southland there was much fear expressed that the work of the dredgers would inevitably result in the total destruction of the land. This does not appear to have been the case to the extent predicted, as on some of the lands which have been dredged vegetation has sprung up, and appears to be preferred by cattle to that of adjoining land which has not yet been disturbed. The planting of forest trees on the dredged tracts has also been attempted, with every promise of success.

#### Obituary.

GEO. W. LADD, the discoverer of the Bullfrog mines, died at Goldfield, Nev., March 26, of pneumonia.

THOMAS TELLEY, aged 74, locomotive engineer, is dead at Fort Wayne, Ind. In fifty years' active service he never injured a human being with his engine, on the Pennsylvania railroad.

W. A. TAYLOR died at Pueblo, Colo., March 20, from effects of an operation. He was an owner of the Allegheny mines and mills, near Telluride, and prominently connected with the advancement of San Miguel county.

ISAAC L. REQUA of Oakland, Cal., died at his home on March 28. He was one of the men who earned fame and fortune on the Comstock Lode in its early history, accomplishing among other great work the sinking of what is known as the Combination shaft, sunk at the joint expense of the Hale & Norcross, Chollar, Potosi and Savage mining companies. It is one of the great deep shafts sunk on the Comstock that still remains open. Mr. Requa retired from active mining life some years since to accept the presidency of the Central Pacific Railroad, an office he held for many years. He was born in 1828.

#### Trade Treatises.

The Western Iron Works of Los Angeles, Cal., sends a booklet describing their gas engine, claiming that it vaporizes and gasifies heavy fuels as well as volatile fluids.

Catalogue No. 18, of the Union Gas Engine Co. of San

Francisco, Cal., shows by illustrations the design and mechanical construction of the Union stationary engines and the improvements made in their twenty years' experience.

The Reliance Machine & Tool Co., of Cleveland, Ohio, describe their bolt threading, pipe threading and nut tapping machinery and accessories in a neat catalogue, which also contains considerable practical information for the machine shop.

#### Personal.

C. M. EYE of Trail, B. C., is in San Francisco, Cal.

ALBT. ROBERTS is now superintendent St. Ives mine, Goldfield, Nev.

S. S. GATES is superintendent Pozos mine near Ahualulco, Colima, Mexico.

H. C. LAY has returned to Telluride, Colo., from an extended Eastern visit.

H. K. WHEELER has returned to Los Angeles, Cal., from an extended Eastern trip.

SIDNEY S. REEVES is millman and assayer for the Echo M. Co., near Mojave, Cal.

W. B. DEWALL, E. M., of Denver, Colo., has been examining mines in Sonora, Mexico.

J. H. TALBOT is superintendent of the Reina del Oro M. Co. at El Tirol, Sonora, Mexico.

J. E. MCINTYRE is manager of the Rey del Oro M. Co., Magdalena district, Sonora, Mexico.

JAS. M. WHEATON succeeds C. A. Wightman as president Gavilanes M. Co., Durango, Mexico.

W. E. STEWART has taken the management McCann mine at Butte City, near Jackson, Cal.

W. R. GRACE, secretary Ingersoll-Sergeant Drill Co., has returned to New York from Butte, Mont.

MANAGER DOMMERQUE, Kellogg Switchboard & Supply Co., Chicago, Ill., is visiting California.

C. H. SISSON of San Francisco, Cal., is assayer at the Pfau mine, Cherry Creek, Yavapai county, Ariz.

J. H. KINKEAD has returned to Virginia City, Nev., from an extended trip to his interests in Mexico.

W. H. HENDRICKSON has been appointed assayer at the Bingham-New Haven mine at Bingham, Utah.

W. RYAN has been appointed superintendent Silver Shield mine at Bingham, Salt Lake county, Utah.

HARRY MITCHELL is the new superintendent Vacas San Marcos M. & M. Co., Vacas, Durango, Mexico.

W. G. PAGE, superintendent of the Red Elephant mines at Hailey, Idaho, has been in Salt Lake City, Utah.

W. H. WHITESIDE succeeds W. J. Chalmers in the vice-presidency of the Allis-Chalmers Co., Milwaukee, Wis.

E. HILTY is superintendent Pasadena Con. M. Co., working east of the Gold Road mine, Acme, Mohave county, Ariz.

M. M. KIRKPATRICK, consulting engineer D. McKenzie Co., New York, is manager Midnight Co.'s property, Goldfield, Nev.

W. M. CURTIS has been appointed superintendent American Flag mine at Park City, Utah, succeeding the late J. G. Rhodin.

C. E. GILLAN will succeed F. Taylor as superintendent Bingham-New Haven mine at Bingham, Salt Lake county, Utah.

L. PARSONS is superintendent Nevada Goldfield M. Co., in the Gold Mountain mining district, 9 miles west of Thorp's Wells, Nevada.

ARTHUR CLARE has resigned as mill foreman Ymir Gold Mines, Ltd., to take a similar place at the Nickel Plato mill, Hedley City, B. C.

J. B. HARRIS of Stockton, Cal., has been appointed superintendent Jose Gulch mine, near Jackson, Amador county, Cal., succeeding W. E. Stewart, resigned.

E. S. DAUGHERTY, consulting engineer Inca M. Co., Trapatá, Peru, S. A., via Arequipa, was in Denver, Colo., the past week and is now in New York on his way to Peru.

F. E. NORTON, of the Citizens' Consolidated G. M. Co. of Wheeling, W. Va., and R. B. Stanton of New York have been inspecting mines in the Cracker Creek district, near Bourne, Or.

JESSE F. McDONALD, Colorado's new Governor, is of a distinguished mining family, and is an old and successful miner, who thoroughly understands all phases of the mining situation and the requirements of the mining man.

WM. DAVEY has resigned as superintendent Lightner mine, Angels Camp, Calaveras county, Cal., to accept a similar position with the Tintic M. & D. Co. at the Yampa mine, Bingham Canyon, Utah, taking the place of W. J. Craig, resigned.

C. S. VERRILL, of Republic, Wash., has taken charge of the construction of the Crooked River Mining & Milling Co.'s evaporating plant at the Hogan mine, at Oro Grande. He will also have charge of the mine and act as consulting engineer and metallurgist for the company.

L. W. TRUMBULL, geologist University of Wyoming, is making an examination of the coal fields along the U. P. R. R. He will soon visit the Shoshone reservation which is to be thrown open in June, 1906, for the purpose of examining the coal fields of that region.

DR. C. D. WALCOTT, director United States Geological Survey, has returned from Ottawa, Canada, to Washington, D. C. His mission was to secure co-operative advantage in the harmonious working of the American and Canadian departments of the public service, satisfactory advance having been made with that end in view.



## Books Received.

The Geological Survey of Ohio is doing a good work in the development of the mineral resources of that State by not only showing how and where the minerals occur, but also how they may be utilized. The latest bulletin, "The Manufacture of Hydraulic Cements," by A. V. Bleining, gives one of the best practical accounts of this important branch of structural engineering yet published in the English language. It is valuable alike to the manufacturer and the consumer. The author defines his subject as a material that hardens in water as well as in air, and treats of it in four subdivisions—pozzolana cements, hydraulic limes, Roman cement and Portland cement—showing why the latter, theoretically and practically, has the greatest strength. The second chapter deals with the raw materials of each kind, being especially explicit on the slag and Portland cement industries. The chapter on the analysis and testing of raw materials is preceded by a valuable account of prospecting and sampling practice and includes technical instruction on the chemical and physical examination of clays, sands, limes and slags. An account of the manufacture of pozzolana and natural cements is followed by an exhaustive discussion of Portland cement, its nature, its raw materials, how they are most economically won and prepared and how burned and ground. This subject is handled in great detail, and, while severely technical in treatment, is eminently practical. The consumer will be interested in the methods of testing Portland cement found in the last chapter. This book gives little chance for adverse criticism, and a more general knowledge of its contents will do much to improve the quality of this important building material. Through ignorance, plants have been built in poor places and are not intelligently managed, producing thousands of barrels of poor material, whose use tends to discredit cements as a class. In the words of State Geologist Ed. Orton, the book states "what materials are needed to make good cements, what mechanical treatment is necessary and what effects will result from deviations of the prescribed quality of materials or treatment." The book can be obtained from the office of the State Geologist at Columbus, Ohio, at cost of publication or will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of \$1.50.

## Commercial Paragraphs.

J. A. YEATMAN, engineer and salesman for the United Iron Works of San Francisco, is in Los Angeles, Cal., on business.

R. N. NASON & Co.'s increasing business necessitates a change. Their new address is 117-119 Market street, San Francisco, Cal.

H. M. MONTGOMERY has been appointed Chicago sales manager of Alberger Condenser Co., and has opened an office at 316 Home Insurance Bldg., Chicago.

THE Western Pacific Railway Co. now has right of way from Oroville, Cal., through the Beckwith Pass. A general construction contract has been let to W. H. Brown & Bros. of New York.

GEO. W. MYERS, 917 Hayward Bldg., San Francisco, Cal., representing the Chrome Steel Works of Chrome. N. J., reports large sales of shoes and dies during March. He is now on a business trip to New York and intervening points.

THE C. H. Shaw Pneumatic Tool Co., Denver, Colo., has appointed the Compressed Air Machinery Co., San Francisco, Cal., agents for California, Nevada, Oregon and Alaska. The Shaw Co. report the sale of drills to several parts of the country.

THE S. H. Supply Co. of Denver, Colo., report sale of a plant comprising a duplex station pump, boiler, etc., to the Weldon G. & C. Co., of Arizona, a 10-stamp mill with copper plates and power plant to California men and a 50-ton concentrating plant to Idaho.

THE Vencedora Mine Equipment Co. of San Francisco, Cal., has sold a 50-ton Vencedora bot blast smelter to a mining company in British Columbia, and another of twenty tons capacity to a Mexican company. On the order books is one of fifty tons for Missouri for smelting lead ores.

THE Fulton Iron Works, San Francisco, Cal., have shipped one 20-stamp mill and one of five stamps to Mexico, also a 10-stamp outfit for the Volcano M. Co., California. They have recently sent to the United States of Colombia, S. A., a 90-foot steel side wheel steamboat, being the first order for this class of work from that country to be filled by San Francisco works. England has heretofore controlled the business.

THE Union Gas Engine Co. of San Francisco, Cal., recently installed a 125 H. P. three-cylinder marine engine, and a complete electric light plant in the German government schooner Ponape. This engine is fitted to run on kerosene, gasoline or distillate. This company is now building two of this same type for the John J. Sesson Co. of San Francisco; two for the Pacific Shipping Co., of the same city, which are to be installed in the Argus; and two for the Albion Lumber Co., also of San Francisco, Cal. In the Auckland, N. Z., anniversary regatta, Jan. 30th, in the motor launch races for boats over 26 feet, Union engines were successful in securing first, second, third and fourth places. In the races for boats under 26 feet Union engines secured both first and second places. In the motor launch races of the Hobart, Tasmania, regatta, the launch Dart, 21 feet fitted with 2½ H. P. Union engine, won first place. The course was 6 miles long.

## Latest Market Reports.

SAN FRANCISCO, March 31, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 56½c, refined (1000 fine); San Francisco, 56½c; Mexican dollars, 46c, San Francisco; 43½c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37½@15.50; Electrolytic, 1 to 3 casks, \$15.37½; Casting, 1 to 3 casks, \$14.87½. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £67 10s spot per ton.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 10s per long ton.

SPELTER.—New York, \$5.87½; St. Louis, \$6.15; London, £23 12s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.87½@30.00; San Francisco, ton lots, 31c; 500 lbs., 31½c; 200 lbs., 32c; less, 33c; bar tin, 35@37½c. London, £137 12s 6d.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb. lots, 19.75c; San Francisco, Plumbers', 100-lb. lots, 16.50c.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., .04c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes bigger; redwood, \$28.00@30.00; lath, 4 cts, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, bd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2\*, 35%, carload lots, 9½c; less than one ton, 11c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@3c; powdered sulphur, 2½@2c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B. 1½@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, hoiled, hbl., 60c; cs., 65c; raw, hbl., 58c; cs., 63c; Lucol oil, hoiled, bbl., 51c; cs., 56c; raw bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As; tral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c, Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c, do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., hbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, ½ lb., 80c.

PHOSPHORUS.—American, ½ lb., 70c.

SODIUM.—Metal, ½ lb., 50c.

BISMUTH.—Subnitrate, ½ lb., \$2.10.

URANIUM.—Oxide, ½ lb., \$3.50.

MERCURY.—Bichloride, ½ lb., 77c.

TUNGSTEN.—Best, ½ lb., \$1.25.

SILVER.—Chloride, ½ oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ½ lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Per lb., \$2.75.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, ½ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STROUG & Co.'s SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MARCH 21, 1905.

785,193.—LATHE—J. M. Brown, South Bend, Wash.  
785,660.—DEMILION HANDLE—W. E. Brown, Los Angeles, Cal.  
785,474.—PLOW—D. G. Burkhardt, Dayton, Wash.  
785,289.—HANGING SCAFFOLD—T. J. Campbell, San Francisco.  
785,197.—STEP LADDER—H. H. Case, Bismarck, Ariz.  
785,291.—STATEMENT AND COLLECTION RECORD—M. M. Cohn, San Francisco.  
785,602.—PRESSING MACHINE—W. H. Fisher, L's Angeles, Cal.  
785,611.—ENGINE—C. E. Hastings, Griffin, Cal.  
785,670.—WHEEL—C. H. S. Helling, Alameda, Cal.  
785,214.—EXTRACTING ORES—W. A. Hendrix, Los Angeles, Cal.  
785,215.—BOOK MARK—G. W. Hill, Brookfield, Wash.  
785,553.—PUMP—E. Hoornbeck, Riverside, Cal.  
785,423.—WOODEN PIPE—J. Hopkirk, Seattle, Wash.  
785,509.—FLY ESCAPE SCREEN—J. S. Johnson, San Francisco.  
785,556.—BRUSH SCRAPER—G. E. Kent, Ce. Italia, Wash.  
785,616.—STUMP BURNER—Keywood & Elmer, Tacoma, Wash.  
785,504.—VEHICLE AXLE—P. Le Scuer, Calabasas, Cal.  
785,315.—ELECTRIC RAILWAY—T. Mahoney, San Francisco.  
785,555.—AMALGAMATOR—P. McEntee, Spokane, Wash.  
785,267.—BASTING DEVICE—H. McPhail, Visalia, Cal.  
785,369.—PROPELLER—E. G. Meinecke, Alameda, Cal.  
785,512.—BRIDGE BIT—T. Mili an, Fortuna, Cal.  
785,635.—THERMOMETERS—J. Peterson, Tacoma, Wash.  
785,228.—LOCK—R. Phelps, Seattle, Wash.  
785,435.—AWNING—J. R. Powell, Los Angeles, Cal.  
785,330.—CHURN—S. B. Rathbun, Stockton, Cal.  
785,332.—CAKE MIXER—F. R. Schmidt, San Francisco.  
785,336.—PUMPING ENGINE—O. O. Storie, Tacoma, Wash.  
785,655.—CORSET FASTENING—H. W. Thurlow, San Francisco.  
785,584.—CAN MILK MACHINE—M. A. Wharton, San Francisco.  
785,245.—GAGE TOOL—E. Wiet, Sacramento, Cal.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Stroug & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

DOOR AND WINDOW FLY-ESCAPE SCREEN.—No. 785,309. March 21, 1905. Joseph S. Johnson, San Francisco, Cal., one-half assigned to Francis Cutting of same place. This invention consists of an improved screen having in combination vertical wires forming the warp, horizontal wires forming the filling of the screen, one or more of said filling wires being omitted at intervals between the top and bottom of the screen, offsets formed by bending the screen at approximately right angles, said offsets including the spaces formed by the omitted filling wires and the warp wires being separated within these offsets to form openings and strengthening ties across the offsets, a frame having the sides formed with inclines and offsets corresponding with the screen, to which frame the screen is secured, and one or more vertical tension rods extending between the top and bottom members of the frame, said rods substantially straight, extending from the inner angle of each offset across the space formed by the inclination below, and being attached again to the screen at a point contiguous with the next offset. This device permits the escape of flies from rooms, at the same time preventing their entrance from outside.

CAKE MIXER.—No. 785,332. March 21, 1905. F. R. Schmidt, San Francisco, Cal. This invention consists in the combination of a container inclosing a circular chamber, a rotary dasher or mixer concentric with said chamber and mounted on a horizontal axis, said dasher including a plurality of radially supported rings, cross wires connecting said rings, cross rollers supported between said rings and movable in close proximity to the interior of the chamber, radially disposed removable scrapers carried by the dasher and adapted to engage the sides of the container, said container having an ingress passage and a closure for said passage, said closure having a bottom section sloping downwardly in the direction of rotation of the dasher, the lower edge of said incline, bottom being substantially continuous with the inner periphery of the mixing chamber and means for rotating the dasher.

OUTSIDE HANGING SCAFFOLD.—No. 785,289. March 21, 1905. T. J. Campbell, San Francisco, Cal. This invention consists in the combination of a plurality of outriggers provided with means to attach them to a fixed part of the framework, bars suspended from said outriggers, the latter and said bars having corresponding perforations, a U-shaped clip slipped over an outrigger and the end of a corresponding bar and a pin or bolt passed through said perforations, said U-shaped clip serving to relieve the strain of said pins or bolts on the outriggers, brackets carried by said suspended bars and a flooring or equivalent carried by said brackets, and other details of construction, all adapted to bring about the desired result.

ELECTRIC RAILWAY.—No. 785,315. March 21, 1905. T. Mahoney, San Francisco, Cal. This invention comprises in an electric railway system the combination with a motor car of a sectional trolley rail and a sectional conductor abreast of said trolley rail, a switchbox disposed relative to each trolley-rail section, a solenoid in said box, a feeder, a core reciprocal in said solenoid and adapted to close the circuit between the feeder and trolley rail and to carry the motor circuit, current collectors on the car contacting with the trolley rail and the outriggers, the sectional conductor collectors in constant electrical connection with the return irrespective of the direction of travel, and an actuating circuit shunted off from the motor circuit and passing through a solenoid, thence across to a corresponding section of said sectional conductor up into the car through said sectional conductor collectors to return.

COMBINATION STATEMENT AND COLLECTION RECORD.—No. 785,291. March 21, 1905. Max M. Cohn, San Francisco, Cal. This invention consists in a combination statement and collection record comprising original and duplicate sheets, said original sheet having a reserved area designated for the customer's name, a reserved area designated for the account and an intermediate area printed with the merchant's name, and said duplicate sheet having reserved areas registrable with the said areas of the original sheet which are designated for the customer's name and the account, and having, also, an area registrable with the said intermediate area of the original sheet, provided with notation in permanent form which is resorted to by the collector to indicate the disposal of the account.



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## United Verde Fire.

The press dispatches report that the United Verde mine at Jerome, Ariz., is again on fire. The mine caught fire about two years ago and a large amount of money has been expended in efforts to control it. Bulkheads were built in various portions of the mine where it was calculated it would arrest the progress of the fire and confine the gases of combustion to limited areas. A few days ago a terrific explosion occurred on the 300 level of the mine, which resulted in the death of several miners and the injuring of a number of others. The explosion was attributed to the infiltration of surface



United Verde Mine, Jerome, Arizona.



The Mill at Cananea, Mexico. (See Page 220.)

water to the region of the fire, where a large volume of steam formed, with the result stated. The destruction of the bulkheads gave access to fresh air and the fire began to make rapid progress again. At one time a carbonic acid plant was installed at the United Verde and a large volume of this gas was sent into the mine, but the effect was only temporary. In such instances the only known method by which a fire may be completely quenched is by flooding the mine, and this expedient at the United Verde is considered impracticable, owing to the scarcity of water. When the sulphide ore in a mine takes fire, either spontaneously or through being ignited by flames from burning timbers, or otherwise, it is almost impossible to extinguish the fire as it passes into the solid rock mass beyond the reach of the direct application of any method to extinguish the fire. No flames appear with a fire of this description; the rock simply smoulders for months and sometimes for years.



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ALTHOUGH the mining laws governing Alaska are the Federal Statutes, there is no essential difference between these laws and those governing the location of mining claims in the United States. Much complaint is made of the so-called "blanket locations," made in Alaska—that is, wholesale locations of creeks or other territory by other persons than the actual locators themselves. In some States the legislative bodies have enacted laws which require a stated amount of work to be performed on each claim within a limited time—sixty to ninety days—and this, to a great extent, prevents wholesale location of mining ground by any but bona fide locators who intend to develop their claims. Alaska has no Legislature, but the act extending the mining laws to Alaska contains among other provisions the following, in section 26: Citizens of the United States, or other persons who have legally declared their intentions to become such, may locate, occupy, and work mining ground in Alaska, under such reasonable rules and regulations as the miners in organized districts may have heretofore made or may hereafter make, governing the temporary possession thereof for exploration and mining purposes until otherwise provided by law; provided further, that the rules and regulations established by the miners shall not be in conflict with the mining laws of the United States. Such being the case, it seems reasonable that the miners of a district may themselves make rules and regulations which will require a stated amount of work on each claim located within limited time, but they can in no manner restrict the number of locations that may be made by one person.

## The Smelter Fume Problem.

The creation of sulphurous and arsenical fumes is an accompaniment of all smelting operations where the ores contain sulphide, antimonial, arsenical and other volatile compounds. In some districts the damage from fumes has led to the introduction of various methods for rendering them harmless. The most common practice is to make sulphuric acid as a by-product of the smelting operations. This is based upon the fact that water will, under proper conditions, absorb a large volume of sulphurous fumes. Fortunately, in many cases, the acid thus manufactured finds a ready market at a price which makes its manufacture profitable, or a portion of the acid may be employed in some other branch of the metallurgical establishment, as in leaching the oxidized ores from upper levels, or that which has been partially roasted.

It is not always convenient nor profitable for smelting concerns to engage in the manufacture of acid, as it is sometimes impossible to find a market for the product. Within the past few months this problem has been prominently brought before smelting companies throughout the West, usually in the form of court injunctions, with accompanying suits for damages. In Colorado, near Durango; at Butte, Mont., Keswick and Vallejo Junction, Cal., and in the Salt Lake valley, Utah, this has been the unpleasant experience. In each instance, excepting that at Keswick, Cal., where the complainant is the Government, against the Mountain Copper Co., the plaintiffs have been the farmers who own property in the vicinity of the smelters. So serious has the matter become, and so evident is it that the complainants can cause the metallurgists much trouble, that it is not unlikely that some new method of disposing of sulphurous and other damaging fumes, less expensive and less cumbersome than that of acid making, will be introduced. At Butte, Mont., the construction of a stack several hundred feet in height, connected with the dust chambers of the furnaces by a flue of great size, and half a mile in length, has accomplished something in the way of condensing some of the fumes, such as those of arsenic and antimony, which are sublimated in the chambers and flue and form a by-product of value, but the sulphurous fumes are less easily controlled and do not condense so readily. The most destructive fumes are those resulting from heap roasting, a method of preparing sulphide ores for smelting, which has the advantage of economy, but as the fumes rise in dense clouds directly from the ore heaps, and are not carried away by the winds from the tops of tall chimneys, and thus, to some extent, dissipated by the winds, the damage is greater than in the case of stacks. Heap roasting is not now practiced to a great extent at American smelters, though at one time an important feature of metallurgical operations at Keswick.

NO profession requires so broad and complete a knowledge of scientific and practical subjects as that of the mining engineer. In addition to having acquired a comprehensive knowledge of practical mining in all its branches, he must have had a thorough grounding in mathematics and have had training in civil engineering, mechanical and electrical engineering, and in chemistry and metallurgy. Besides this, he should have a knowledge of other languages than his own—chiefly Spanish, French and German. In addition, he must have had training in geology, physics, architecture, natural and social sciences, practical business experience and, above all, he must be endowed with a substantial amount of what is usually spoken of as common sense.

THE first trains have passed through the noted Simplon tunnel recently completed beneath the Swiss Alps, joining Italy and Switzerland. It is stated that in the central section of the tunnel the heat was found terrific, nearly suffocating the passengers. This high temperature is due to the large volume of hot water flowing from crevices cut in the excavating of the tunnel, and which gave so much trouble to the engineers at the time. Unless proper ventilating means can be found to reduce this temperature, the tunnel driven through the mountain at such great cost is likely to be less popular than was expected.

COMPARISONS are being made between the cost of Chinese labor and native labor in the mines of the Rand in South Africa, and these figures show somewhat to the disadvantage of the Chinese. In making such comparisons it is essential to know all the respective conditions in the mines compared. Though two mines may adjoin, the underground conditions and equipment may differ in essential details which will make a marked difference in the cost of mining. One mine may practice sorting and the other may mill all the rock broken in the stopes, or the most of it. In this case the tonnage hoisted and milled will indicate that the mine that does no sorting is doing the cheaper mining, but the result in gold produced per ton milled may show largely in favor of the mine where sorting is practiced. The fairest test of relative value of Chinese and Kaffirs or any other two classes of men, as workmen, is the cost sheets of the mine as operated by these two classes of men, separately at various times, when all other considerations are equal. The Chinese are replacing Kaffirs in the mines of the Rand, and not white men, as many suppose. It was only owing to the inability of the mine operators to secure a sufficient number of native laborers that Chinese were put into the mines at all, as an experiment. There are some branches of mining which require skilled white miners, and these places neither Chinese nor Kaffirs can ever hope to fill. There is abundant opportunity for white miners on the Rand who are skilled in timbering and machine work, but it would be unwise for white men to go to South Africa without a contract with some reliable company.

IN his annual report to the stockholders of the El Paso mine, Cripple Creek, Colo., the president says: "So effectively has the El Paso drainage tunnel done its work of draining Cripple Creek district, that a movement is on foot looking to the construction of another and deeper tunnel, which will drain the camp about 750 feet below the present water level. \* \* \* This tunnel will cost approximately \$300,000, and will require about two years to complete it, but it will give ten years' work to those mines embraced within the area drained, without having to pump water. \* \* \* I am in favor of a new tunnel, and propose to ask your board of directors to contribute liberally toward its cost." This is a spirit well worthy of emulation, and it is thought that the opposition to the new tunnel will gradually disappear, as the project takes more tangible shape. There can be no doubt of the great benefit the proposed tunnel would be to the district. If the mines are enabled to operate for a period of ten years without pumping, for a cost of \$300,000, it is not the tenth part of the cost of what pumping would be, and a division of the expense of driving the tunnel among the mines of the district that would be benefited by it would make the cost to each individual mine so small as to be a matter of little consequence.

ELECTRICAL engineers have met with such pronounced success in their undertakings, overcoming so many obstacles and disproving the adverse criticism of pessimists, that they now look forward with confidence to the successful operation of transcontinental lines of railroad. It is thought that there is sufficient latent power in the falls and streams of the mountains through which such roads will pass to supply the necessary power to not only carry the trains over the mountains themselves, but across the intervening valleys as well. A leading electrical magazine says on this topic: "Electric railways for transcontinental purposes can come into existence as soon as the practical pressure at which they can be worked can be settled."

THE size and cost of a tailings plant, to work an old dump by cyanidation, should be considered with reference to the amount of material to be treated and the probable profit which may be derived from the operation. More than one large cyanide plant has been installed, to learn that the available material, at the profit possible per ton worked, could never pay for the initial cost of the plant, to say nothing of a net result, and there are those which can not pay a profit on the working cost. This state of affairs is chargeable to the engineer who advised the operation and, perhaps, also designed the plant.



## CONCENTRATES.

OWNERS of mining property are not ordinarily responsible for damages done by lessees of their property.

THE charge of ore that may be treated in a chlorination barrel is variable—according to the size of the barrel.

TUNGSTEN ore is being successfully reduced at the 20-stamp mill of the Wolf Tongue Co., Nederland, Boulder county, Colo.

PYRITE has a commercial value of about \$5 per ton in large quantities at San Francisco, Cal. It is used in making sulphuric acid.

LARGE electric magnets are employed in handling iron and steel castings, forgings, etc., in many large foundries and machine shops.

MOLYBDENITE has been successfully concentrated in Canada by means of electro-magnetic separators. It is difficult to concentrate by other means.

COINAGE in the new Denver, Colorado, mint will begin July 1, 1905. A description of the coining machinery to be used appeared in the issue of Nov. 12, 1904.

TALCOSE ORES and those containing a large amount of clay may be crushed better if first subjected to calcination, which drives out the water held in the ore.

DOLOMITE is a magnesian limestone and not an eruptive rock. Dolorite is a coarse-textured basaltic rock, and has been confused with the former term—dolomite.

PLACER DIRT that runs 50 cents per ton where sufficient water and dump (good grade for tailings to flow away) are available should pay well, under experienced management.

NO SINGLE COPIES of this journal, issued prior to Jan. 1, 1866, can in future be supplied. With some few exceptions a copy of any issue since Jan. 1, 1866, can still be furnished.

AN old machine drill, no longer serviceable in the mine, may often be found still good enough to make a shop trip hammer to forge drills and other large pieces, and for general use.

WHAT is known as No. 9 tunnel of the Sierra Buttes mine, Sierra county, Cal., is in 7000 feet and cut the vein 3000 feet below the apex of the vein, on the dip. It is one of the longest tunnels driven for the operation of a mine in California.

GRAPHITE makes a good lubricant for stamp stems. Care should be taken to keep the graphite from falling into the mortar. Careful millmen cover the tops of their mortars, the stamps rising and falling through holes cut in the cover, which is in two sections.

IT is proposed to place an 80-inch searchlight on the summit of Mount Hood, Or., to be used during the Exposition at Portland. It will cost about \$30,000 to do this. The only object stated is that of producing some unusual electrical effects as an Exposition attraction.

IN England disused shafts of coal mines are sometimes used by shot makers in place of towers, the rent being much cheaper than the interest on the cost of a tower. In many shallow coal pits which have been abandoned vegetable gardeners make profitable use of them for garden plots.

WHERE ore is hard and flinty, and very fine crushing is necessary to free the gold from the gangue, a large stamp duty cannot be expected. It is the duty of the millman to secure the best economic results. He must get the greatest possible capacity with the least possible loss in tailings.

EXHAUST steam may be utilized in many ways, effecting marked economies. It may be employed to heat boiler feed water; to heat the drying room; to heat the water for the miners' bath and lavatories; to dry ore; to heat mills and other buildings; to create ventilation by draft, and in many other ways.

SETTLING CONES and other forms of hydraulic classifiers are usually made with slopes of about 50°. There is no absolute uniformity about this angle, however. In most large plants where classifying cones are used the slope angle of the cone is steep in the smaller sized cones, becoming flatter with increasing diameter of the classifier.

THE capacity of the ordinary dredge of present use is from 2000 to 3000 cubic yards per day, when working at depths from 40 to 60 feet. The capacity of any dredge is generally greater in shallow diggings—15 to 20 feet—than those dredging to 50 and 60 feet. The cost of operation is variable, but ranges from 6 cents to 10 cents per cubic yard.

THE rainfall in the foothill region of the Sierra Nevada mountains, in California, from 1863 to 1883, ranged from 17.28 inches in 1863-64 to as high as 102.22 inches in 1871-72, the general run being from 35 to 74 inches. In 1867-68 it was 99.70 inches at North Bloomfield. The average for twenty years was nearly 60 inches per annum.

IN some instances where pyritic smelting is practiced a small amount of coke is charged to aid in keeping the ore from settling too solidly on the zone of fusion. In a furnace of large capacity the weight of the column of ore is considerable, and with some ores—particularly those containing much fines—the ore may pack so solidly as to retard the running of the furnace.

THE first safety fuse was invented by William Bickford, a Cornishman, in 1831. This original fuse was much the same as that manufactured to-day. It consisted of a thread of powder around which was spun jute yarn. The fuse was water-proofed by dipping it in coal tar. In these later years a water-proof tape is wound around the fuse in single, double or triple layers.

THE city of Toronto, Canada, is preparing to install a pumping plant, the main feature of which shall be a triple-expansion flywheel pumping engine having a daily capacity of 6,000,000 imperial gallons. The imperial English gallon contains 277.274 cubic inches; the standard United States gallon, 231 cubic inches. The imperial gallon is equal to ten pounds avoirdupois of pure water at a temperature of 62° F.

IT is not always safe to assume that a smooth, wall-like surface in a vein is actually a wall, for as good ore, if not better, may lie just on the farther side of it. This applies particularly to ore occurrence in massive rocks, such as porphyry, andesite, granite, etc., but it is also applicable to slate and schistose rocks. Many good ore shoots have been missed or long laid untouched because the miner did not crosscut his country rock.

SEVERAL YEARS of experimenting in numerous gold districts has proved that slimes and sands can not be satisfactorily worked together in any leaching process, but that by separating these two products of the mill by hydraulic classifiers the two may be treated separately, and usually satisfactorily. The sands by percolation, and sometimes the slimes also, through the filter press, is often used in the treatment of the latter.

"CONCENTRATES" has heard of an instance where, in a 40-stamp mill, after standing idle for months, on being started up, nearly one-half of the stamp stems broke off just above the boss head within a week, and several others before the month had elapsed. Stamp stems sometimes break when the guides are not properly adjusted, and again without apparent cause. The reason for the remarkable breaking of stems in the mill above referred to was not stated.

ONE-INCH steel hoisting ropes are heavy enough to hoist ordinary mine loads from 1500 feet. The rope is always at its best when new, and the longer it is used the smaller grows the factor of safety. Ropes also deteriorate when wound on the hoisting reels and remaining idle for long periods. It is then practically impossible to properly lubricate them, and any moisture present is likely to cause the wires to rust. Serious accidents have occurred upon resuming the use of hoisting ropes which had long been idle.

A DUMP OF MATERIAL from a mine placed, or allowed to accumulate, on the land of another, becomes the property of the party owning the land where such dump is allowed to accumulate and remain, and the owner of the land may convert to his own use such dump material—sand, rock or ore. On steep mountain sides, where the rock dumped from a mine car or other vehicle rolls down the slope upon or across the land of another, the only damage that can be collected is for injuries actually sustained to improvements. Such injury consists of filling existing workings, damaging buildings and endangering lives and other property.

THE origin of petroleum is still a subject about which there are many theories. At one time it was supposed by some geologists to be due to an accumulation of fish and animal oils. Others believe petroleum to be of vegetable origin, and still others think it of volcanic origin, though the votaries of the latter theory do not make it clear how the oil originated. A late theory is that petroleum is due to chemical action taking place in the rock strata beneath the surface. It is a mooted question. Even in the regions where oil is found it is generally confined to a definite stratum, though in some regions there are two or more strata yielding oil.

AS TO which is preferable, a shaft or tunnel, as the main working outlet of a mine, the surrounding circumstances and conditions must determine. The tunnel has the advantage of much lower first cost per foot, and usually also of cost of maintenance. The tunnel also drains everything above its level, and greatly aids ventilation—particularly if a connection be made by raise with the surface. The relative length of tunnel to depth of shaft should be considered, as well as the cost of hoisting plant and operation of the same. There are many instances where a tunnel ten times the length of a shaft

to reach the same depth would be justified by the results accomplished through the medium of the tunnel, although the first cost of the tunnel is possibly from two to three times greater than that of the shaft.

WHEN drilling through sedimentary rocks composed of beds of a few inches thickness each, but of greatly varying hardness, the miner is often obliged to tamp holes already drilled with pieces of rock; but this gives an unsatisfactory result. It is better, when the thickness of the hard layer has been ascertained, to drill deep enough into it to break that stratum only, removing the soft rock underneath by picking, when the next hard layer found below may be treated in like manner, by drilling block holes, which will result in breaking the hard stratum only. Formations of this description are found in some Cambrian rocks and are particularly abundant in Lawrence county, S. D., on Two Bit gulch, Squaw creek and in the Spruce Gulch section.

THERE are three main uses for fluorspar. The highest grade, which runs less than 1% of silica and is white in color, is sold either ground or in lump for use in the enameling, chemical and glass trades. The second grade of spar is used in steel making and is sold unground as lump or gravel. It includes colored spar and may run as high as 4% silica. It is demanded for openhearth work in smelting because of the great fluidity which it gives the slag. The lowest grade of spar, including all running over 4% silica or spar mixed with calcite, can be used in foundry work, and while the price is always low, there is possible a large market. In some cement manufacturing concerns fluor is used to aid in making the "clinker," which it does owing to its easy fusibility.

THE amount of water necessary to properly concentrate a ton of ore depends upon the character of the ore and its gangue. Under ordinary conditions about 2000 gallons of water are used per ton of ore, though in some cases, as at some of the Butte, Mont., concentrators, it runs up to 5000 gallons per ton of water. The ordinary stamp mill requires about 800 gallons per ton crushed in the battery and from 200 to 400 gallons added on the concentrators. At Park City, Utah, F. W. Sherman is concentrating 400 tons of ore every twenty-four hours with the use of twenty to thirty gallons of water per minute, or only 700 to 800 pounds of water per ton of ore. This is in the concentration of slimes. The ores carry silver as sulphide and chloride associated with iron, lead and zinc.

TIN SULPHIDE is of comparatively small importance commercially, the greater part of the tin of commerce being obtained from cassiterite (the oxide). Stannite, the sulphide, is roasted to free it from the sulphur. It is then mixed with charcoal in a furnace and smelted. The first product of this operation is an impure alloy of tin, which is reheated slowly and the metal drawn as soon as it melts, this first metal being much purer than the alloy from which it is obtained. Tin has a very low melting point (230° C.) and if heated to a high temperature will boil and take fire, and the white oxide thus formed passes away and is lost, therefore it is advisable to have the furnace well under control. A certain amount of the tin present always combines with the silica of the furnace linings to form slag.

IN sampling a mine the only correct way to estimate the value of a block of ore is to take samples, uniform in character at stated and not too great distances. This distance is generally about 5 feet. Samples should preferably be taken with a maul, and the size should be determined by the length of cross-section of the vein from which the sample is taken. Thus if a sample from a place where the vein is 12 inches wide weighs five pounds, one from a place where the vein is 24 inches wide should weigh ten pounds. This is the natural result of cutting all sample channels of uniform width and depth. The samples having been taken, sacked and numbered, the assays when made, together with the width of the vein where the respective samples were taken, furnish the basis for estimate. The addition of the values of all the assays, divided by the sum of all the widths of samples taken, will not give the correct result. Each sample must be written in feet, or decimals of a foot, and the assay result in dollars multiplied by this width in feet. The total result of all the dollars obtained by this multiplication is then divided by the total width sampled in feet, and the quotient is the average value per foot of width of the vein. If there were three samples taken, No. 1 is 3 feet, assays \$4 = \$12; No. 2 is 2 feet, assays \$6 = \$12; No. 3 is 1 foot, assays \$10 = \$10. The sum 1 foot, 2 feet and 3 feet (the several widths taken) is 6 feet. The sum of \$12, \$12 and \$10 = \$34, which divided by 6 feet = \$5.66 = the average value per foot of width at the places sampled. Each block must be sampled, measured and the estimate of quantity and value made separately, and the whole added for gross result. The sampling of a large mine is a difficult and tedious job and requires unusual care, even if there are none of what may be considered moral hazards, among which are salting of the ore in place; salting of the samples as they are taken; salting of the sacks before or after the samples have been taken. It requires constant vigilance, and if hasting has to be done in a mine having rich and spotted values the difficulties are increased, for the sampler is likely to salt himself unintentionally. Known rich streaks should be sampled separately and estimated accordingly.



## Electricity Applied to Mining in California.

Written for the MINING AND SCIENTIFIC PRESS.

One of the most interesting mining regions in California, both mineralogically and geologically, is the territory embraced within the holdings of the Mariposa Commercial & Mining Co., in Mariposa county, Cal. It comprises over 44,000 acres—about 70 square miles—most of which has been classified as mineral land. The tract has been variously known in the past as the Mariposa Grant, the Fremont Grant and Mariposa Estate. The grant extends 2 or 3 miles along the Merced river, in the neighborhood of Bear Valley, southerly to a mile or two south of the town of Mariposa, a distance of 17 miles. Its width is variable, being from 2 to 12 miles wide, averaging about 5 miles. Within this area are found an interesting series of rocks, most of which are identified with the ore deposits of the gold belt. The principal rocks are clay slates, schists and graywacke of the Mariposa beds, slates and schists of the Calaveras formation (Paleozoic), great masses of serpentine and intrusions of diabase, diabase-porphyrite, diorite, felsite and other intrusives and a large area of diabase tuffs, much of which is altered to amphibolite schist.

Throughout the entire area are scattered gold-bearing veins and ore deposits, the most marked feature being the aukerite masses of the Mother Lode, which has its southern terminus in this tract, near the old village of Bridgeport. The mineral territory is not confined to the boundaries of the grant, but extends beyond it on all sides.

Pocket mines, occurring under a variety of geological conditions, are an important feature of the mining industry in this section. These mines have produced several millions of dollars, the Mariposa mine alone being credited with more than a million dollars from pockets, beside a large amount from milling ores. The Oso mine, near Bear Valley, is credited with a production exceeding \$400,000 from pockets. Many other mines of lesser note produced large amounts. Some of the pockets were superficial and many hundred thousands of dollars were recovered at nominal expense in the neighborhood of Bear Valley, Princeton and Mariposa.

The principal mines of the grant were the Mariposa mine, at the town of Mariposa; the Princeton and Mount Ophir, near Mount Bullion postoffice, formerly called Princeton, and the Pine Tree and Josephine, near the Merced river, north of the town of Bear Valley.

Beside these were many others, including the Green Gulch mine, near Princeton, and the Oso and Mexican, near Bear Valley. The most noted mine on the grant was probably the Pine Tree and Josephine. This property is on the Mother Lode and has all told several miles of development work. One tunnel run on the Pine Tree vein is in over 5000 feet and is at present being driven ahead and other work done there. Shafts are sunk in this tunnel and other extensive development work done.

Near the summit of the mountain, where the vein outcrops in great masses of red and brown iron oxide, traversed in all directions by veins and masses of quartz, thousands of feet of drifting and crosscutting have been done from tunnels and crosscuts driven in from the surface. In the years succeeding 1860 the Pine Tree and Josephine produced gold bullion from \$60,000 to over \$350,000 annually for several years.

The pay ore was found scattered along the great lode in a series of pay shoots. Seven of these shoots were developed and worked during the early history of the mines, but of recent years these mines have been practically idle until lately. There still remains a large amount of ground to explore, but the great size of this property alone makes the undertaking one of considerable magnitude, requiring much time and money.

The Princeton mine has been the largest producer on the Mariposa estate, that mine having produced over \$1,000,000 working to a depth of 600 feet. After making this record, the mine was closed down for many years until 1899 when it was reopened, under the direction of J. H. MacKenzie. When working in the 60's the Princeton mine yielded over \$90,000 per month for a long time. The richest ore came from within 100 feet of the surface. It paid \$70 per ton in milling rock, beside a large amount in rich specimens, few of which, it is said, having been seen by the company. The vein has a beautifully banded structure, and consists of white granular quartz, divided into ribbon-like plates. Evidently it represents, to some extent, the replacement of the slate rock in which it occurs. The sulphides are principally pyrite and galena, the gold being most abundant in the ore carrying galena. Much of the gold was found beautifully crystallized. The mine

has now been reopened several hundred feet below the former workings and a 50-stamp mill is kept employed on ore from the newly opened ore shoots. There is a large amount of quartz all about the Princeton mine, particularly on the western or foot-wall side of the vein, where there are innumerable

veins and veinlets of quartz for a distance of 1000 feet. Some of these veins are gold-bearing.

The Mariposa mine is near the town of Mariposa. At the south end the vein occupies a single fissure and is from 2 to 12 feet wide. The quartz is often crystallized, affording many handsome specimens of



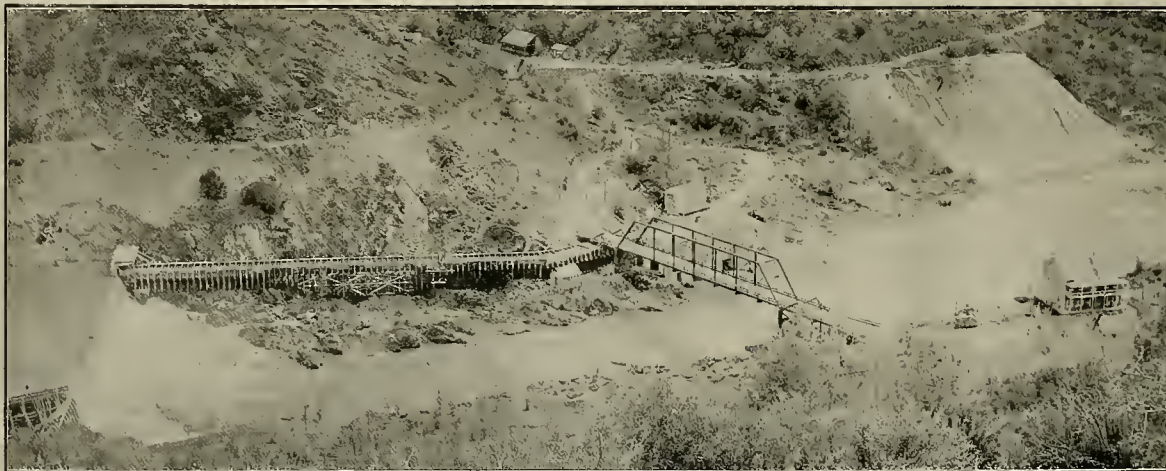
The Princeton Mine and Mill, Mount Bullion, Cal.



Mariposa Mine, Mariposa, Cal.



Dam on the Merced River at Bagby, Cal.



Dam, Flume and Power House of the Mariposa Mining and Commercial Co., Bagby, Cal.



rock crystal. This portion of the vein is in diabase-porphryite, much decomposed and soft near the surface, but hard and tough and of a dark green color, with phenocrysts of plagioclase in depth. Near the main shaft, which is sunk on an incline dipping to the west, the vein splits, and slates are found in contact with the vein. Near this split large pockets of gold were found by the early miners. In the veins beyond the fork the gold is more evenly distributed, but west of this fork the vein produced chiefly pockets, the intervening quartz being practically barren of gold. In depth, however, this mine has developed several shoots of payable mill rock. A 20-stamp mill is in operation on this mine.

The mines of this property mostly lie in a high valley between the Bear Mountain range on the west and Mount Bullion range on the east. There are few perennial streams in this area, which is from 1200 to 1500 feet higher than the Merced river, a stream of variable but good size in even the lowest stage of water. This peculiar situation has rendered the development and operation of these mines somewhat more expensive than in some more favored sections of the gold belt of California, but the existing conditions have been modified by the installation of an electric plant.

A year ago California stood second in the United States in the utilization of electricity for electro-motive purposes and recent developments of her wonderful water power show that she may soon be first in this country. Dredges, hoists, compressors, pumps, underground locomotives, rock drills and lights are now dependent upon electricity in many mines. The greater part of the power so used is supplied by large distributing companies with central plants generating thousands of horse power. In addition, many of the mines have put in independent plants of smaller capacities. These are usually run by impact water wheels, but as editorially suggested in a recent issue there is also a large field for the use of the turbine.

The electric equipment of the Mariposa Commercial & Mining Co. offers a typical example of the latter. It was put in because of the large and increasing demands for fuel at the different mines of the company and its increased cost per cord. Consequently, in July and August, 1901, a dam and power house were put in at Bagby on the Merced river. The power is generated by four McCormick turbines, in two pairs of 27 and 30-inch size, direct-connected by flexible leather linked couplings to a 400 K. W. three-phase Westinghouse type 2B generator. The turbines have a total capacity of 730 H. P. when all four wheels are operating under a 25-foot head, and a capacity of 600 H. P. under a 25-foot head. During low water periods when the wheels are called upon to operate under a 29-foot head, the maximum amount of power is obtained from 3000 cubic feet of water per minute. The generator has a speed of 240 r. p. m., 7200 alternations, 30 poles, an e. m. f. of 440 volts, and at normal rating gives 525 amperes per terminal. This generator is designed to run at a full load efficiency of 93%, with such regulation that with 525 amperes per terminal, 440 volts e. m. f., and 100% power factor, there will be a rise of 8% e. m. f., if the load is thrown off; and when running at 90% power factor the separately excited field current will be 15% greater than when carrying the same armature current at 100% power factor. The excitation of 65 amperes at 100 volts is secured by means of a 15 K. W., 125-volt, compound wound, multipolar generator, running at 600 r. p. m. The exciter is driven by means of a pair of 9-inch McCormick turbines, mounted in one case, provided with a 30-inch thimble, and discharging into a common draft tube. These are similar in all respects to the main 30-inch turbines—that is in regard to the necessary regulating gates which in this case are operated by hand. The exciter and its turbines are directly connected by means of flexible leather link couplings, bored and keyed to the turbine shaft.

From the power house the current is transmitted at 1500 volts to substations at the Princeton and Mariposa mines, 9.2 and 15.7 miles respectively. Each is equipped with three 75 K. W. transformers, primary voltage 15,000, secondary 450, 475 and 500. The power from the Princeton substation is used to light the Princeton mine and mill and the town of Mt. Bullion, and to run seven motors ranging from 3 H. P. to 150 H. P., aggregating 318 H. P. These motors run the 50-stamp mill, air compressor for the mine, machine shops and pumps. At Mariposa the power is used in lighting the Mariposa mine, mill and town and in running the air compressor, 20-stamp mill and pump.

The plant has been in full operation since the first of June, 1902. The power curve for the time of operation shows the rate of fall of the river during the summer, and the minimum amount of water available is usually toward the end of October, but 35 cubic feet per second flow in the whole river being a minimum. The dam has been strengthened and repaired a number of times. The plant is provided with auxiliary steam power to tide over the dry season and to be used in case of accident.

The duty of shift bosses is to keep the time of the workmen and to see that the men do not shirk their duty, but they have also to look after the distribution of tools, timbers and other supplies.

## A Graveyard Shift Below.

Written for the MINING AND SCIENTIFIC PRESS.

The experience here detailed is that of a single shift in sinking in a vertical shaft, and it will doubtless be found by many miners to be merely a recitation of their own personal experiences under somewhat similar conditions.

The "graveyard shift" went on at 11 p. m. and quit at 7 o'clock the following morning. We were working three eight-hour shifts, with three men on each shift. The hole was down 300 feet—a small double-compartment shaft, about 7x12 feet outside the timbers. The shaft made about 3000 gallons of water in twenty-four hours as a general thing, but occasionally we would hit a pocket or reservoir of water that drove us out for a day or two, and sometimes for a week at a time, until the pump could control the water. It was a nice place to work, if it were not for the fact that the water was icy cold, and plenty of it, the rock hard as steel and often fissured by invisible seams that set at naught all our calculations as to how the ground would break. We carried full shaft sets throughout, notwithstanding the hard ground, for, although it was firm enough, there were frequently treacherous seams of talcy mineral that caused the otherwise solid rock to cave at times.

On this particular occasion the bulletin at the surface contained the following, which, as the saying is, was "short and sweet:"

"Ten holes fired. Nine gone. Look out for missed hole. Muck and timber. STEWART."

Which, being interpreted, meant that ten holes had been drilled, charged and spit by the preceding shift and that they had been able to distinguish but nine reports. The orders were to muck out the broken ground and then put in a set of timbers, or make a start at it. For some reason the crew on the previous shift had gone before we arrived at the mine and there was no one to give us other information than that contained on the bulletin in the shaft house. Stewart was a sort of shift boss on the former shift. We climbed onto the bucket with our picks, shovels, hammers and gads and were lowered into the hole by the engineer. When about 20 feet from the bottom the bucket stopped and two of us got off and climbed through a hole in a side bulkhead and proceeded to lower the suction hose, which was suspended from above by block and tackle. When the upper end came in position, we attached it to the pump and rang for steam. Meantime the third man had been lowered to the bottom and had worked out a hole at one side for the suction. He was standing half way to his knees in water.

With much hissing and groaning and some bucking the sinker got down to work and rapidly drained the water so we could see the broken rock filling the bottom of the hole.

"Where does all this kindling wood come from?" asked one of my companions.

We looked up the shaft and saw a post had been knocked out of the last set and was lying back in the corner, resting on the lower plate, but in such a position that it threatened, if in the least disturbed, to fall on our heads.

The bucket was rung down and a zinc tag hanging to the cable was smoked with a candle, and then Sam O—scrawled with the point of his candle stick, "Send down a 'studdle' and 2 pieces lagging." The bucket was rung up—1 bell followed by 2 bells, a pause, and 2 more bells, which was our way of telling the engineer to look for a message. The pump continued to work away, and we dug a deeper hole for it in the muck, and shutting off steam for a minute shifted it over to the new "sump." In about five minutes the bucket came in sight and in it was a post—one of the regular size used in the set, and two lagging. With the latter we made a small platform and attempted to put the post in place, but it could not be done without easing off. I sent up a message, "Send down shaft wrenches." After a few minutes the bucket returned with the wrenches. We had been endeavoring to ease off the wedges so that the set could be pounded down about a half inch, and after unscrewing the hanging bolts a little we finally got the post in place and drew the bolts up tight, pounded the wedges back again until everything "rang like a bell."

The next thing was to begin mucking. It did not look like a very big pile, evidently the last round had not broken well. We went at it and sent up four or five buckets. At one corner we had exposed solid rock, and we were beginning to "look out for the missed hole." It is not exactly the most pleasant thing in the world to contemplate—a missed hole—even when you have located it; but to be picking around in the bottom of a wet shaft, several hundred feet below the surface, the only light that of the spluttering, sickly, yellow flames of three candles, almost extinguished by the falling mist and drops of water, makes the job a delicate one. The work must go on, however, and there are plenty who are not only willing, but anxious to do it. At first the miner is momentarily fearful of striking it and being blown into "kingdom come," or crippled for life, but

in time he becomes accustomed to missed holes, the same as to the other manifold dangers of his calling, and he takes a missed hole as one of the episodes in his life as a miner, and, though more cautious, is not less industrious.

We continued mucking until, as the empty bucket came below, I stepped away and close up to the wall at one side of the shaft. While standing thus, watching the slowly descending bucket, whirling as it came down, a small rock struck me on the hand. It came from somewhere overhead. I looked up, but could see nothing in the uncertain light. The bucket was dragged to one side, and we commenced to shovel in the rock from the bottom of the shaft. Jim R—was working on the same side as myself. Suddenly he stopped shoveling and gazed up into the blackness overhead. I looked at him enquiringly and he said, "Damme, somethin' 'it me." I said, "yes—a piece of rock fell on me a minute ago." Just then a shovelful of small stuff and a chunk of rock, weighing about 10 pounds, fell just back of me, near one corner of the shaft.

"She's comin'," said Jim, and in a twinkling he, Sam and myself made a jump for the bucket, but as it was drawn well to one end of the shaft, I knew it would swing to the opposite end if a bell were given to hoist, unless some one steered it.

I rang 3—1. In a few seconds the cable grew taut and the bucket was slowly lifted and swung under the hoisting compartment. Small quantities of the rock continued to fall from one side of the shaft, back of the plate. We all got on the bucket, which put our hands just in reach of the hanging bolts of the first set. I reached out toward the bell line. Just as I grasped it, down came nearly a ton of rock into the shaft. In a twinkling all three of us were up on the timbers, and climbing for dear life on the bolts from set to set, seeking a place of safety.

For about two minutes rock and timber continued to fall, and then all we could hear was the clack of the pump and the dripping of the water. We relit our candles and surveyed the darkness below in hope of being able to estimate the amount of damage and the probable continuance of the caving of the ground. As there was no further sound of falling rock or lagging, we finally climbed down to the last set and found that all of the lagging on the east side had gone down, and with it a ton or two of rock from behind the set. It was a wedge-shaped mass extending the full length of the shaft. It looked dangerous, and neither of us felt like taking any extra risks. After sitting awhile on the timbers, clinging to the bolts, and watching for further evidences of a continuance of the cave, we decided that the only thing to do was to get a timber and fit it in back of the set, lace it up with lagging and fill up the hole.

Jim went on top, got an extension "measuring staff," and we carefully measured the length of the hole. Then Jim and Sam went up, while I remained to watch the cave. In about twenty minutes down came the bucket with an 8-inch log hauging beneath it. I steered the log to one end and the bucket landed on the bottom. Sam cut a hitch at one end, standing on the lowest wall plate and using a pick. The ground was soft about the seam that had caused the cave. We finally put one end of the timber in its place and the other end was lifted and pulled up. I stood on the bottom, while Sam and Jim worked above on the timbers. I held the log above my head, my arms outstretched to their full length. Sam had to cut a little more because the piece would not go into the hitch. Meanwhile streams of ice-cold water trickled down my arms beneath my shirt and, following down my shoulders and ribs, began to fill my gum boots. I stood it as long I could and then called out, "Hurry up! I can't hold this all night." "Ow you gettin' on, son?" said Jim. "Hurry up!" was all I could say, as, with chattering teeth, I held up my log. Finally they relieved me of the weight and the end was fitted into the hitch and wedged up. I had about a gallon of water in each of my boots and was soaking wet from head to foot. I grabbed hold of the cable and managed to get my feet up higher than my head and most of the water ran out of the boots. We then laced up the cave by inserting the lagging which had fallen out, and leaning a line of stout sticks from the pole we had put in, to the wall back of the cave. As the lagging proceeded we threw about half a cord of wood, sent down from the surface, back of the lagging and so filled up the hole. When this was all done we went on top and ate our lunch and returned to the shaft and put in the remainder of the shift mucking out. We did not find a missed hole, as in all probability two holes had gone at the same instant and the explosions been counted as one. We got the timbers and materials down for the next set, but had no time to put them in before going off shift. "Time" did not come around too soon.

There were many such shifts in sinking this shaft. If it was not one thing it was another—always something unusual and unexpected happening. It seemed to me that there were no two shifts just alike. We worked both single and double-handed in this shaft. The single-handed man drilled the squaring-up holes, when they were necessary—and that was often, owing to the contrary manner in which the ground would often break. If no block holes or hitches were required, the single man drilled at one end of the shaft, while the "double team" polished the steel at the other end.



## A Typical Lake Superior Copper Mill.

The mills used for many years in the Lake Superior copper region form a class by themselves, and differ in many respects from those usually found in gold and silver mining regions. There are two main reasons for this. One is that the low grade of ore produced by the Lake mines necessitates a large capacity for economic reasons, and the other reason is that the peculiar class of ores of that district permit the employment of these mills, which have not, as yet at any rate, found favor in the eyes of precious metal miners. The following description of the

The entire plant—mill, boiler house and trestle approach—is of permanent steel construction. The foundation walls are of sandstone rubble masonry; the trestle and interior foundation piers are of concrete. The mill building and boiler house are of steel frame construction, with steel roof trusses; the walls are of timber sheathing, covered with corrugated iron, and the roofs are of plank with magnesia covering. The columns are I beams and built-up H sections, the latter being used for small columns where the width of I beam flanges would be insufficient.

The boiler house contains five 250 H. P. water tube boilers, set in three batteries. The mill equipment consists of four steam stamps, a horizontal tandem-compound Corliss condensing engine, with cylinders 13x36 and 23x36 inches; a 28x14-inch

ding engine parts. The roof is high enough to allow the trolley to lift a stamp engine cylinder and carry it over the cylinders of the other stamps.

Water for all purposes, amounting to approximately 10,000,000 gallons per twenty-four hours, is obtained from a reservoir formed by a steel dam on the Salmon Trout river. The head of water from the dam to the supply tank is 17 feet, and to maintain a uniform head the water flows into a standpipe, connected to the service tank by a pipe with valve for regulating the supply of water and the water level in the tank.

The steam stamps or stamp mills have cylinders 20x24 inches. Each stamp strikes 108 blows per minute; the weight of the striking parts is 2½ tons. The mortar of each stamp weighs

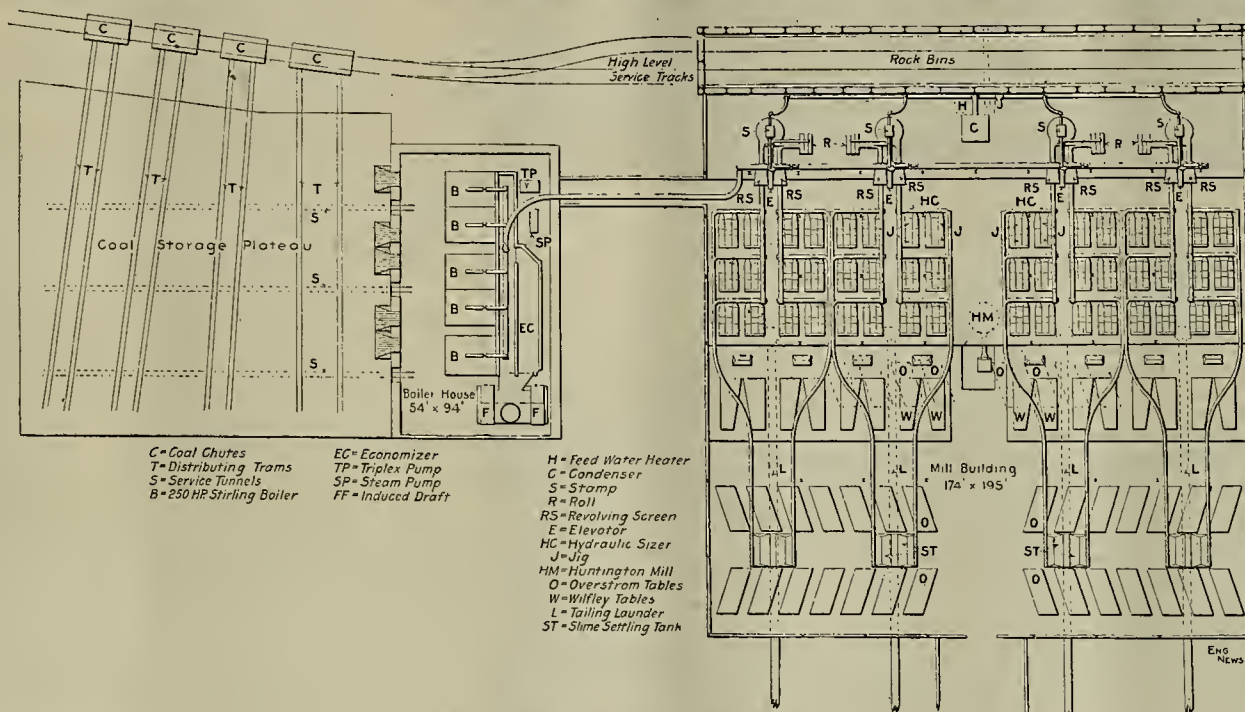


Fig. 1.—Plan of Baltic Mill, Redridge, Mich.

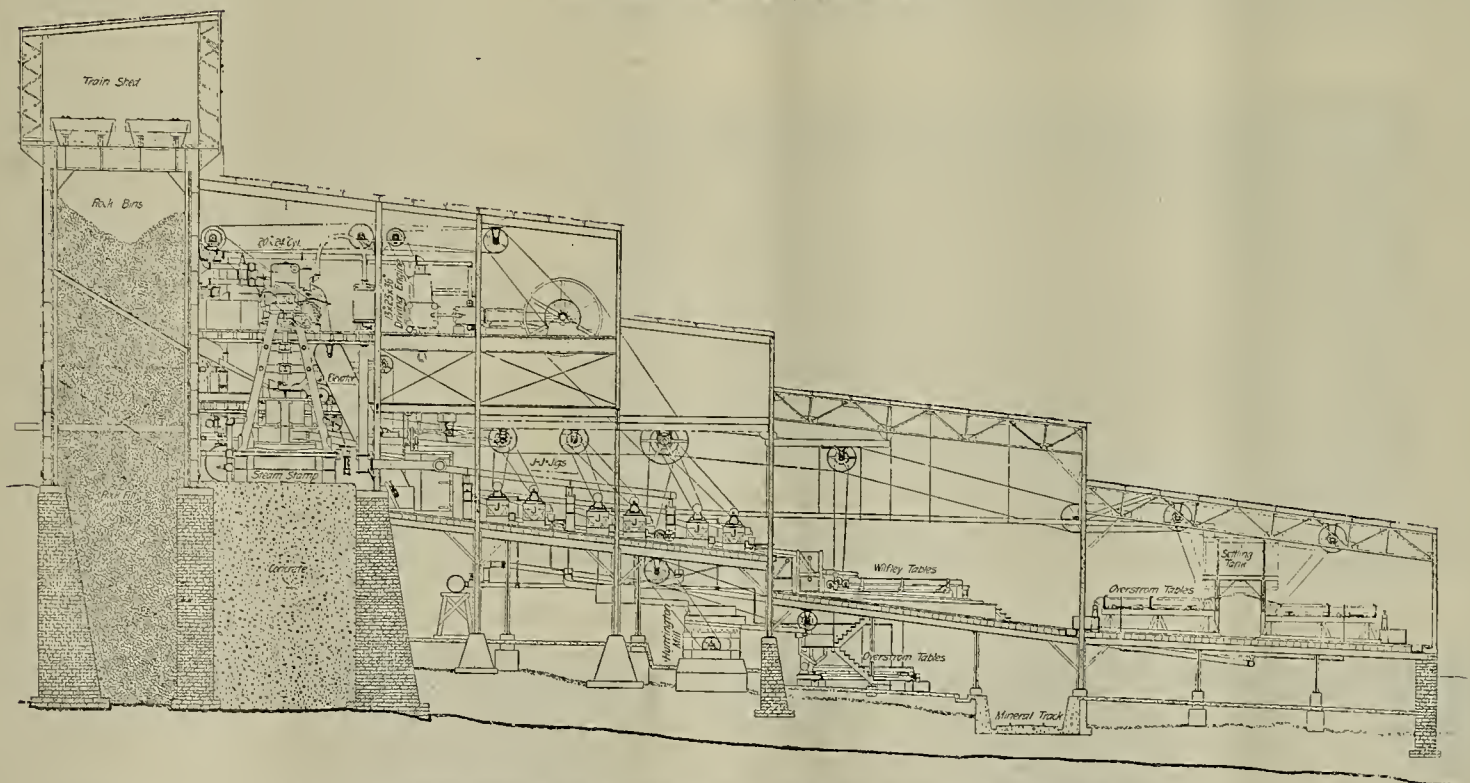


Fig. 2.—Cross-Section of Baltic Mill, Redridge, Mich., Showing Stamps and Concentrating Machinery.

new mill of the Baltic mine is abstracted from the Engineering News:

The recently completed Baltic stamp mill at Redridge, Mich., handles the rock from the Baltic mine, owned by the Copper Range Consolidated Co. It is typical of the modern milling plants which have been erected in recent years by various mines in the district, and is a good example of modern stamp mill design. The accompanying illustration is a plan of the plant. The rock is delivered into the rock house or bin on the upper side of the mill. Water is supplied from a reservoir, and after passing through the mill flows across the beach into the lake. The plant was designed by F. G. Coggin, superintendent of the stamp mills of the Baltic Mining Co., who also supervised the erection and now superintends the operation of the Baltic, Atlantic and Champion mills.

double-belted condenser, and a 54-inch by 14-foot feed water heater. The engine drives the jigs, concentrating tables and all mill machinery, as well as a 30-K.W. direct-current, direct-connected generator. A marine set of 4 K. W. is provided for use when the engine is not at work. Each stamp is provided with an auxiliary Sturtevant centrifugal roll 36x5 inches. The complement of concentrating machinery for each stamp consists of six four-spigot hydraulic classifiers, twenty-four double-compartment eccentric roughing jigs, four Wilfley and seven Overstrom concentrating tables. A regrounding plant consisting of one 6 foot Anaconda type Huntington mill, with seven Overstrom concentrating tables, is located in the basement. All piping for the jigs is laid under the floor. A trolley hoist on an I beam runway over the stamps is provided for han-

13 tons and rests on cast iron anvil blocks weighing 87 tons, which in turn rest on concrete foundations. These foundations are piers 20 feet square and 32 feet high, founded on bedrock. The concrete for 22 feet from the bottom is in proportions of 1 part Portland cement to 3 parts sand and 5 parts stone; for the upper part the proportions are 1:2:4, and this upper part is reinforced by sheets of wire screening—¾-inch wire and 2-inch mesh. These sheets are 1 foot apart, vertically.

The usual practice has been to place timber cribbing under the concrete or between the concrete and the stamp mortar, in order to absorb shock and vibration, but this also absorbs some of the force of the blow. At the Baltic mill there is no provision for elasticity, the mortar being anchored solidly to the concrete and the concrete built directly upon



bedrock. It is, of course, necessary to anchor the mortar very rigidly to the concrete, as any play or lost motion would cause the stamp to batter it to pieces. With this arrangement less steam is required to crush a given amount of rock, or more rock can be crushed with a given amount of steam, than where provision for elasticity is made in the foundations.

In the operation of the steam stamps, to produce a blow sufficiently heavy, the valves are set for a late cutoff on the top end. On the bottom end only sufficient steam to raise the stamp shaft needs to be admitted, so that by far the larger volume of steam is used on top. It will be evident, also, that the effect of the vacuum may be removed from the top end without impairing the striking efficiency of the stamp. Advantage is taken of this fact to secure the exhaust steam required to heat the mill and the feed water. The top and bottom exhausts of each stamp cylinder are independent. A free exhaust main leads through the feed water heater to the atmosphere, and a condensing exhaust main to the condenser. The piping is so arranged that either end or both ends of the stamp cylinder may be run condensing or non-condensing, as desired. In normal operation three stamps run full condensing; in the fourth the exhaust is divided, the top steam going to the feed water heater and the vacuum on the bottom exhaust being still maintained. The only loss attending the large gain is the small amount of steam which is needed on the bottom end to offset the absence of vacuum on top.

In the steam lateral leading to each stamp is a large receiver separator, so that the steam at the stamp throttle is practically dry. The feed water is taken from the condenser hot well at 110° F., leaves the feed water heater at 200° F., and goes by gravity to a tank in the boiler house, in which are also collected all the trap discharges from the steam main and receiver drainage system and the heating system. The triplex pump takes its suction from this tank and delivers the feed water through the economizer into the boiler at 300° F.

The rock is delivered from cars of 42 tons capacity into bins in the rear of the stamps which have a capacity of 2600 tons, above the level of the discharge openings to the stamps. Below this level the bins are filled with waste rock. The arrangement of the mill is such that from the time the rock is dumped until it is delivered as crushed tailings at the other end of the mill all operations are conducted by gravity.

Each stamp is equipped with a mortar provided with screens having  $\frac{1}{4}$ -inch round perforations, and the product through these screens is delivered first upon revolving screens having  $\frac{1}{4}$ -inch round perforations. The screenings from the latter go at once to the concentrating machinery below. The material too large to pass through the revolving screens was formerly returned by an elevator to the mortar of the stamp to be further reduced, thereby greatly reducing the capacity of the stamp. According to practice first introduced in the Baltic mill, this material is now elevated to an auxiliary Sturtevant roll, with which each stamp is provided, and there sufficiently reduced to pass through the revolving screens.

When the pulp has all finally passed the revolving screens it first goes to hydraulic sizers, which deliver four sizes of relatively coarse material, and an overflow containing the finest material, technically termed "slimes." The coarse material is delivered upon jigs. These are boxes kept continually filled with water and consisting of two connecting compartments, in one of which a horizontal screen of 8 to 12 mesh is set about 3 inches from the top, and in the other of which a vertical plunger operates. The sized material flows across these screens and forms a bed upon them. The action of the plunger, forcing water in regular pulsations through this bed, so loosens it that the released copper, by reason of its greater specific gravity, sinks to the bottom and there collects, while the lighter gangue (or rock) is forced over into the tailings or waste. The copper is then automatically removed. Material made up of copper and sand fine enough to pass through the screens is continually passing through the screens on the jigs into the compartment underneath. This material is continuously drawn off, settled in settling tanks, and the settled material delivered upon tables called "finisher" tables. These tables have a plane horizontal surface, approximately rectangular in form, covered with linoleum. This surface is given a longitudinal accelerated reciprocating motion, having a slow forward throw and a quick return. The surface has a slight incline to one side and a thin film of clear water is allowed to flow transversely from the upper to the lower side. The material above mentioned being delivered on the head of the table, the action is such that the heavier copper settles, clings to the surface and travels ahead, while the sand, more or less in suspension, is swept to the side and away. The copper travels the length of the table and is removed. The jigs are placed in a series of steps at the rear, while in the front are the concentrating tables.

In the "tailings" or waste from the jig screens is a considerable quantity of coarse particles which contain copper not released. This material, called "middlings," and amounting in the mill to about 50 tons per twenty-four hours, is automatically removed from the screens before it can get into the waste

and taken to the Huntington mill, where it is ground fine and treated on tables similar to those just mentioned. The slimes or overflows from the sizers are conducted to settling tanks, and the settled material treated on tables similar to those mentioned.

The sources of fine (in size) copper in the mill are, therefore, the jig screens, the finisher tables, and the slimes tables. In addition to these are several sources of coarse copper: (1) Masses picked from the rock before it enters the mortar of the stamp; (2) nuggets of virgin copper varying in size from a filbert to a coconut, which are taken directly from the mortar of the stamp by means of a hydraulic discharge, and consists of a pipe, with proper valves, leading from the interior of the mortar to the outside, through which a stream of water under high pressure is injected into the interior of the same, the force of this stream being so graduated that the heavy copper drops into the pipe, while the lighter gangue (or crushed rock) is kept back; (3) nuggets of smaller size, which are discharged by similar hydraulic discharges located in the launders or flumes leading from the stamps to the sizers. These various products go to make up the mill yield of "mineral," which is shipped in steel cars to the smelter.

**RESULTS.**—The mill was originally designed to handle 2000 tons of rock per twenty-four hours, or 500 tons per stamp. The addition of the rolls has increased this to over 600 tons. The stamps require 300 boiler H. P. each, and the driving engines 150 H. P.

Pittsburg coal showing an average of 13,000 British thermal units per pound is used. In the boiler house is a permanent equipment for the testing of boilers, and the plant under working conditions shows an evaporation of 9.5 pounds of feed water per pound of coal and at 212° F.

The rock treated in the mill contains approximately 27.5 pounds of metallic copper per ton of rock, or 1.07% by weight. Of this, 21.5 pounds are recovered and 5 to 6 pounds lost in the tailings. An 80% extraction is, therefore, indicated. The cost of milling the rock is between 18 and 20 cents per ton.

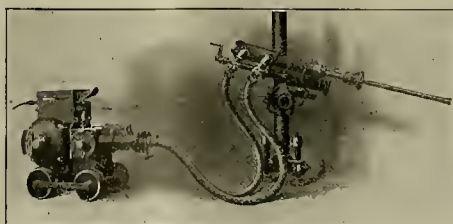
### Electric Air Drill.

One of the latest electric rock drills to be placed upon the market is the Temple electric air drill which is operated by means of compressed air at moderate pressure transmitted through short flexible hose from a small compressor run by an electric motor. The compressed air does not exhaust into the atmosphere, but is retained in the system, requiring a minimum expenditure of power.

The compressing apparatus consists of a small double cylinder air compressor bolted and geared to an electric motor. The compressor has no water jacket and but two small valves. All the gears and bearings are enclosed and run in oil. The drill has practically but one moving part—the piston. A rotating device is used to operate the piston instead of the pawl and ratchet.

According to the statements made by The Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo., the drill has been thoroughly tested in actual work in the mines and it is believed will find a ready market. At present the machine is being made in two sizes. The smaller one requires 3 H. P. to operate and the larger one 5 H. P. to run. The drill strikes 400 to 450 blows per minute, 7-inch stroke.

In the 3 H. P. size the compressor and motor weigh 150 pounds each. The drill also weighs 150 pounds. In this size machine the compressor is mounted on the motor, the latter serving as a base. In the 5 H. P. size the compressor and motor are mounted together on a small truck, the entire outfit weighing 850 pounds, which can be run on the usual mine track and placed on and off the track by two men with a bar. Both size machines, it is claimed by the manufacturers, can be operated by either direct current or alternating induction motors, of whatever standard voltage may be available and desired, either 110, 220 or 440 volts, 220 volts being adopted as the standard whenever practicable.



Temple Electric Air Drill.

The engraving herewith illustrates the drill ready for operation. The shell is similar to that of the ordinary air drill, so that any standard  $\frac{1}{4}$ -inch column or shaft bar can be used.

The bit used in these drills consists of a cross bit, the cutting edge of which forms an obtuse angle. This is upset, so as to give plenty of stock back of the bit, with the result that a hard temper can be utilized without danger of the bit breaking.

The drill is being manufactured and placed on the

market by The Hendrie & Bolthoff Manufacturing & Supply Co., Denver, Colo. They will send a descriptive Bulletin No. 5, explaining more fully the machine, to any one requesting it.

### New Portable Balance.

The accompanying illustrations show a new portable button balance just placed on the market by Wm. Ainsworth & Sons, balance manufacturers of Denver, Colo.

This balance is of the columnless type, constructed to withstand a moderate amount of rough handling. It has a 5-inch beam, agate edges and bearings, fall



Portable Balance, Type R.



Portable Balance, Types R and N, With Carrying Cars.

away pan rests, and is made with either single or double rider apparatus. An improved locking device locks the beam in position on the balance for carrying. The balance is operated from the left hand end and has concealed leveling screws of improved design. Two level vials are placed in the base, instead of a single circular level as sometimes used. The case is of French polished mahogany, and a carrying case of the same material is provided with a leather carrying strap, lock and key. A combination of the portable button balance with a portable pulp balance in a single carrying case forms a compact and convenient prospecting outfit. All parts of the pulp balance pack in the drawer. Full particulars are given in portable balance bulletin, sent on request by the manufacturers.

### Munificent Gift to Mining Men.

Several months ago Mr. John Hays Hammond, E. M., conceived the idea of donating to the service of his fellow workers in California, his former home, a technical library, chiefly devoted to mining and metallurgical subjects, to be placed in some easily accessible public place in San Francisco, Cal. To this end he has placed in the hands of Mr. Chas. G. Yale of San Francisco the sum of \$5000, and has appointed as trustees, to carry out his wishes in this regard, Mr. Chas. G. Yale, Mr. Louis Janin, E. M., and (ex-officio) the State Mineralogist of California, and has selected the State Mining Bureau in San Francisco as a suitable repository for this valuable collection of technical literature. The gift has been made without those conditions which too often subvert the wishes of the donor of such gifts, as well as embarrass the trustees in their desires to do the things which to their minds are proper. The desire of Mr. Hammond is to establish a library of technical works which shall be of value to the professional mining and metallurgical engineer, the superintendent and the miner, as well as others who may be interested in the mining industry. The matter of the selection of books and equipment is left entirely to the trustees above named. The provision is made by the donor that under no circumstances shall the library be removed from the city of San Francisco, but in the discretion of the trustees may be placed elsewhere than in the State Mining Bureau, should occasion arise. It is the intention to purchase suitable cases, desks and other necessary furniture, to secure the desirable books, to have such as require it suitably bound, and to completely catalogue the collection so that the literature in this collection may fully serve the purpose for which it is intended. The trustees will at once assume the responsibilities of their trust, and the library will be established as soon as practicable. This gift of Mr. Hammond is but the initial donation, he having signified his intention of following it up with what further contribution may be necessary to make the library a complete success.



## The Mines of Cananea, Mexico.\*

NUMBER II.—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS.

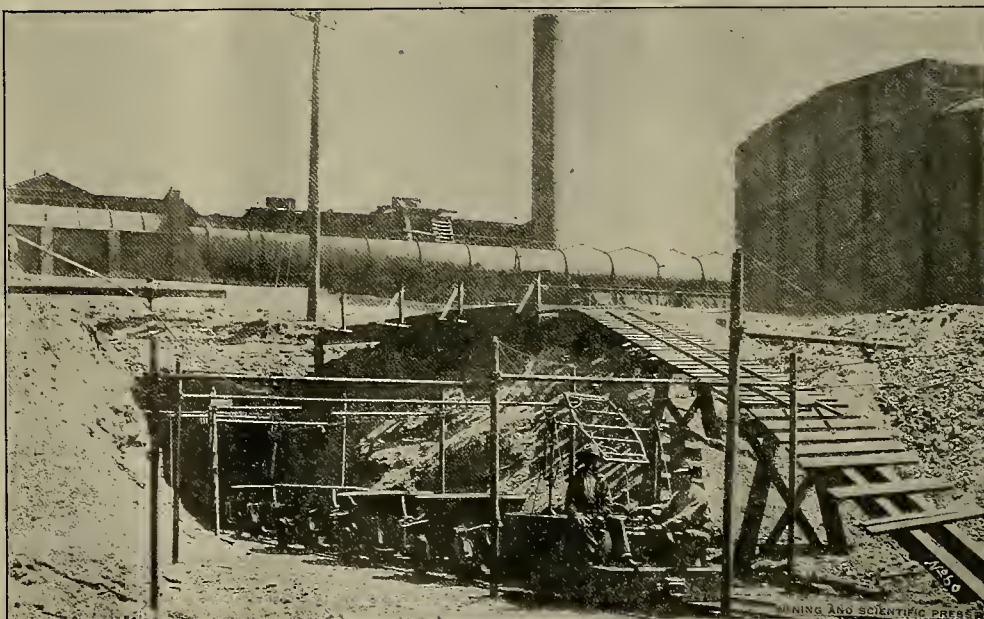
The reduction works of the Cananea Company comprises an extensive power plant, mill and concentrators, smelter and converting plant, with all the accessories to the mining and reduction of the ores of the company. The accompanying illustrations show the extent of the metallurgical plant. One feature of the plant is the frequent extensions and enlargements made to keep pace with the increasing producing capacity of the mines as development was extended. In 1902 the concentrator had a capacity of 600 tons daily, but the plant has since been greatly changed and enlarged and the capacity increased to over 1000 tons in this mill, and a new one has been built during the past few months, which still further increases the output.

The various processes in concentration at this mill were thus officially described by Dr. Ricketts, who reconstructed the concentrating plant: "The work of reconstructing the concentrator was carried out in sections, half of the mill being operated while the other half was being built. A substantial ore bin, of a capacity of 3000 tons, will be built south of the present mill for storage of iron from the mines, and, in connection with this bin, a screening and picking system will be installed.

"Adjacent to these ore bins a new crushing plant will be built for crushing all the ore to size required for preliminary concentration. From the crushing plant the crushed ore will be carried to the receiving bins for each concentrator by a system of conveyor belts.

"In the concentrator twenty-eight jigs will be installed in addition to the four now in use. A vanner house, 38x210 feet, will be added, in which there will

\*See illustration front page.



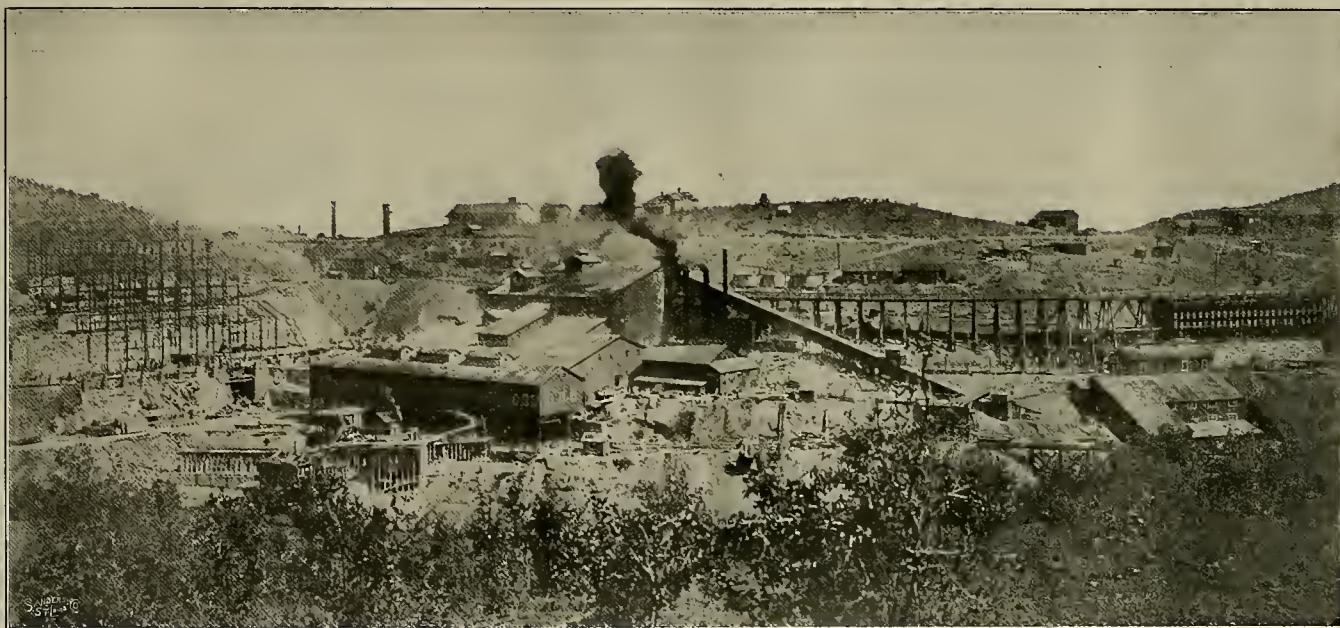
Electric Haulage at Cananea, Mexico.

be placed thirty-six vanners, and two fine-grinding machines will be installed.

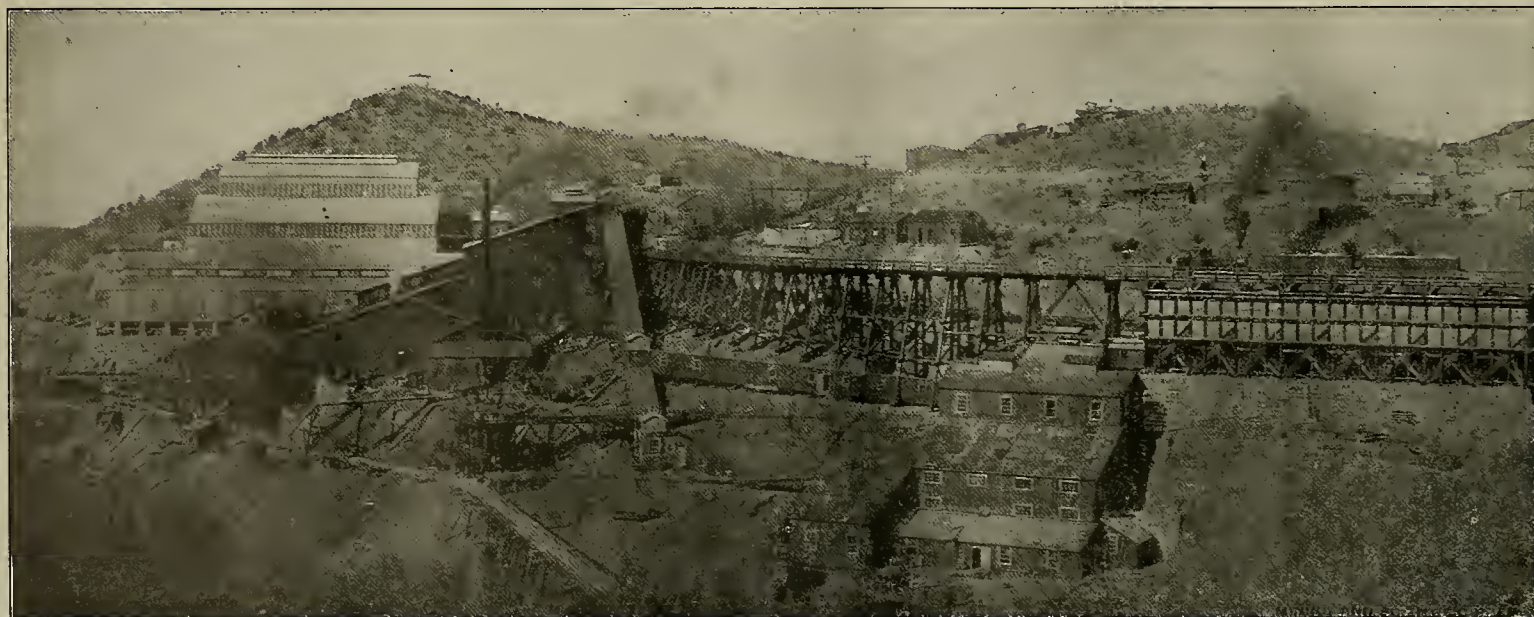
"In the present mill the concentrates are elevated to storage bins on a level with the receiving bins by a system of conveyors, and then loaded into cars by another set of conveyors. This is unsatisfactory, particularly in view of the large tonnage of concentrates—500 tons per day—which will have to be trans-

ported to the smelter when both units are running at full capacity.

"In the face of the large expenditures in the enlargement and reconstruction of this mill, the results expected are of interest. The Veta, Maude and Capote ores are simple ones to concentrate, being easily crushed and easily concentrated. The method proposed involves no radical departure or experi-



The Old Concentrator, Cananea, Mexico.



The New Concentrator, Cananea, Mexico.





The Smelter at Cananea, Mexico.

ments, but is strictly in accordance with successful practice in the treatment on a large scale of ores somewhat similar to these, but less amenable to concentration.

"The results that will be accomplished by these changes are as follows: The capacity of the mill will be increased to not less than 24,000 gross tons per month, including allowance for delays. The mill tailings accurately sampled will contain less than 1% copper.

"Cost of milling will be reduced to 75 cents per ton of ore or less.

"The net increase in value of ore treated over present practice will be fully \$1.70 U. S. currency per ton, with copper at 13 cents in New York. This allows 4 cents per pound for winning the refined copper from the additional concentrates that will be saved, and allows for a loss of 10% in smelting."

### The Leyner Rock Terrier Drill.

The J. Geo. Leyner Engineering Works Co. of Denver, Colo., has brought out a light-weight drill

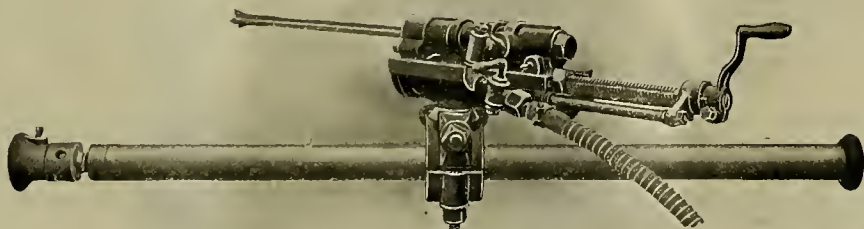
rotating the steel. The steel is rotated as the feed screw is turned, by means of a positive gear connection between the chuck and a sleeve covering the feed screw. This feature makes it almost impossible to rifle and fitcher a hole in the seamiest kind of ground."

The manufacturers further say: "Before these drills were put upon the market, they were placed in several mines in Colorado for several months and accurate record of the work done each day was kept. It was found that they will drill 30 to 45 lineal feet of holes in five hours, including setting up, changing and taking down—depending upon the nature of the rock. The holes drilled were from 1½ inch down to 1 inch in diameter and up to 5 feet in depth."

A full detailed description can be had by addressing the company.

### Of Interest to Miners.

Chas. G. Yale has received from the head office of the United States Geological Survey at Washington, D. C., a copy of every annual report, monograph, bul-



Leyner Rock Terrier Drill—Dry Pattern.

for use in all kinds of work, with the exception of heavy tunneling and sinking. They claim that for stoping and upraising it is especially suitable. It is called the "Leyner Rock Terrier Drill," and is made in two styles—the dry pattern and the water pattern. The dry pattern is only recommended by them for holes above the horizontal; they assert that the water pattern can be used for holes of all kinds, as hollow steel is used, through which air and water in combination are forced for the purpose of cleaning the holes of the rock cuttings.

"Either drill can be changed to the other in a few minutes by the exchange of a few parts and the exchange of steel. The dry pattern has a total of nineteen parts, with one moving part, and weighs 54 pounds, and the water pattern has a total of twenty-seven parts, with one moving part, and weighs 56 pounds. Both drills have cylinder diameters of 1½ inch and consume 25 cubic feet of free air per minute. The mounting used is a column or bar of 2-inch inside diameter, which would make the total weight of the complete equipment, including the drill, mounting and steel, extremely light.

"A unique feature of the machine is the method of



Fig. 1.—Gold Separator and Amalgamator.

ter, and forms an air space, the bottom or L of the riffles turned up at each end and brazed, to hold quicksilver in the bottom of each riffle.

The upper riffles C, made of wood or other substance, but preferably of copper, are held in place by holders which set on top of the holders holding the under riffles, and are placed above and extending down between the top of the lower riffles, the tops of which are bent back with the flow of the water; the bottom is bent toward the flow of the water, with intent to hold the quicksilver in the bend or L. The gold, sand and water pass through the riffle boxes underneath the riffles C, and over the under riffles D, passing into the riffle box at A, filling to the top of the first upper riffle, and then passing under it. Further information regarding the machine can be had from the manufacturer.

### THE PROSPECTOR.

The rock samples from the Mount Hope mine, near Grizzly Flat, Cal., are practically identical, one sample being massive, the other slightly schistose. It is a metamorphosed sedimentary, apparently, though this is difficult to determine from a hand sample. The principal minerals are feldspar, with a little quartz. The brownish color is due to the innumerable small plates of brown biotite (mica). The schist also contains a small percentage of iron sulphide. It is not uncommon to find this rock, which belongs to the Calaveras formation in California, gold-bearing in the East Lode section. The description of the occurrence of the rocks which accompanies them is complete and interesting. It is desirable that all who send samples give as full information as possible.

The light ash rock from Boca, Nevada county, Cal., is volcanic ash and consists of thin plates, threads and grains. It might be useful as an abrasive, or polishing material. It contains no diatoms visible to a magnifying power of 600 diameters. The material is not fuller's earth, as on moistening with water it proves to be slightly plastic.

The rock from Roseburg, Or., is a vesicular dolerite, in which there is a large development of hornblende and olivine. The vesicles are lined with chalcidonic quartz.

The rock specimen from Burris, Cal., is an aggregate of tremolite crystals (a variety of hornblende). It is somewhat altered.

The rock specimens from Selma, Cal., are: No. 1. Dolomite. No. 2. Chalcedony and novaculite. No. 3. Smoky quartz crystals. Neither of these samples is of value. The smoky quartz to be of value must be free from flaw.

The mineral from Nome, Alaska, and mailed from Seattle, Wash., is barite, or heavy spar (sulphate of barium). Its specific gravity is from 4.3 to 4.6. Sometimes used as an adulterant.

The rock samples from Dillon, Mont., are: No. 1. Soft red rock, clay, stained with red iron oxide (hematite). No. 2. Hard, blackish brown rock, with conchoidal fracture, limonite (iron oxide).

THERE are mines at Butte, Mont., which have been burning for several years. The St. Lawrence, one of the noted mines of Butte, has been burning for about twelve years. No attempt is made to extinguish these fires further than to build bulkheads. To flood the mines of Butte is deemed out of the question for the reason that the water would in all probability do more damage than is being done by the fires, and it would in many cases be impossible to flood one of the burning mines without flooding others where there is no fire, and this would not be permitted. A mine fire under ordinary conditions where the timber burns is serious, but where the rock itself supports a fire which cannot be extinguished, the results are far more reaching than in any ordinary mine fire.

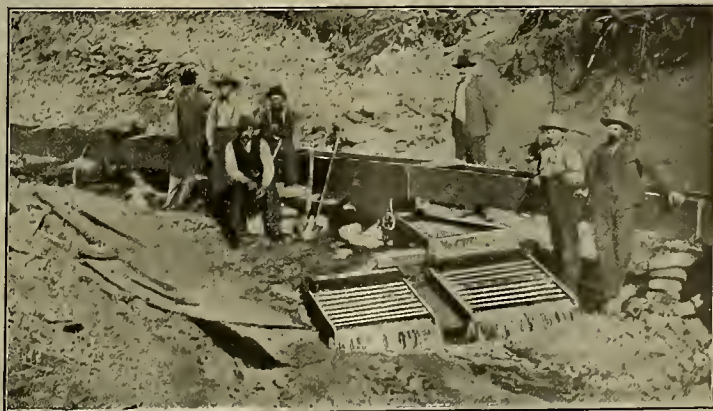


Fig. 2.—Gold Separator and Amalgamator.

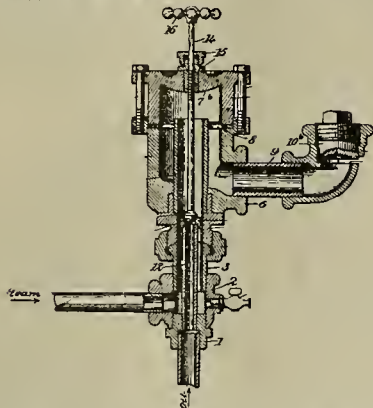


## Mining and Metallurgical Patents.

PATENTS ISSUED MARCH 28, 1905.

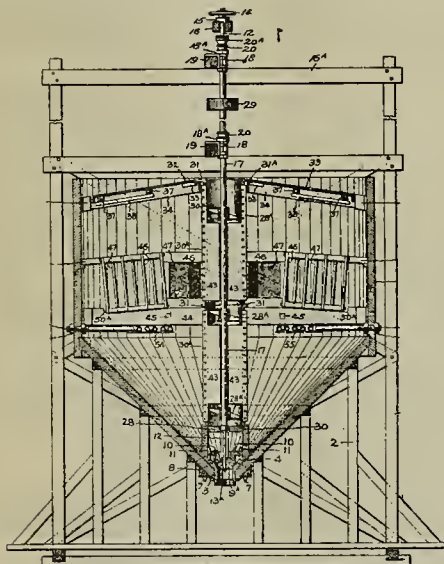
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

LIQUID FUEL BURNER.—No. 785,271; W. F. Richey and T. Daly, Paris, Tex.



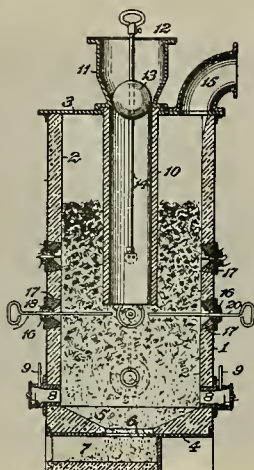
Liquid fuel burner comprising chamber having tube for admitting steam entering it near one end of chamber, liquid fuel inlet within tube, means for mixing fluid and fuel comprising tortuous passage surrounding tube, and having outlet near end of chamber at which tube enters chamber.

APPARATUS FOR EXTRACTING METALS FROM THEIR ORES.—No. 785,214; W. A. Hendryx, Los Angeles, Cal.



In ore-treating apparatus, combination of tank, tank-supporting frame, discharge aperture in tank provided with valve seat, valve operatively supported in valve seat, valve stem secured to valve, means for supporting upper end of valve stem above tank, means for operating valve; tubular propeller shaft surrounding loosely valve stem, casing surrounding propeller shaft, ball bearing and collar for supporting shaft and pulley secured to shaft, with gland stuffing box on top of shaft, and mounted on and provided with suitable packing arranged to pack valve stem and to close opening in shaft.

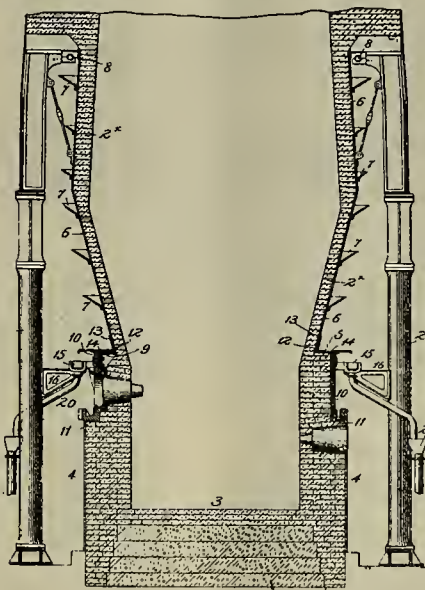
GAS PRODUCER.—No. 785,955; F. W. Johnstone, Mexico, Mexico.



Gas producer, combination of vertical fire cham-

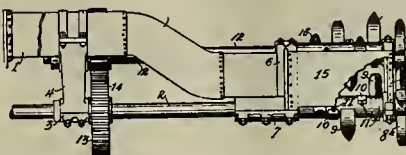
ber, open-bottomed retort depending therein throughout major portion of its height, means for supplying fuel to retort, means for raising fuel which passes out of bottom of retort into surrounding fire chamber space between walls of producer and retort, and gas discharge pipe leading out of upper portion of fire chamber.

COOLING JACKET FOR BLAST FURNACES.—No. 786,180; D. Baker, Newton, Mass.



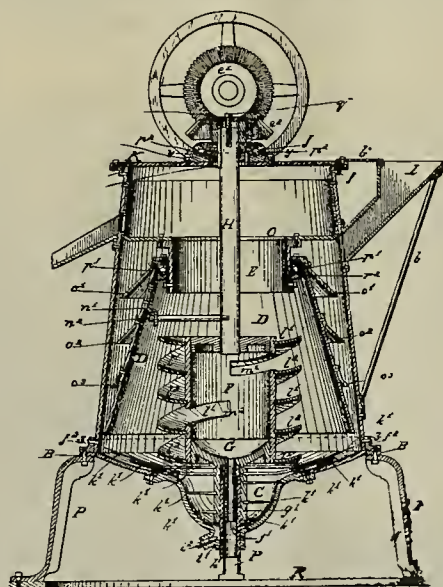
In blast furnace and in combination with bosh wall, cooling jacket surrounding same and provided at its lower end with horizontal flat annular plate forming continuation of outer surface of jacket and having its edge terminating beyond body of furnace, plate adapted to receive without interruption water flowing downward over exterior of jacket and adapted to permit it to be discharged freely outward, and receiving trough sustained free of furnace wall vertically beneath discharge edge of plate in position to receive water flowing over plate.

DREDGE.—No. 786,253; I. G. Gillespie, Oak Harbor, O.



In hydraulic excavator, conduit for excavated material, having downward bend near its forward end, brackets supported by conduit, pair of shafts journaled in brackets, agitator on each of shafts adjacent to inlet of conduit, hood for inlet of conduit and one of agitators, and pair of gear wheels on shaft in engagement with each other.

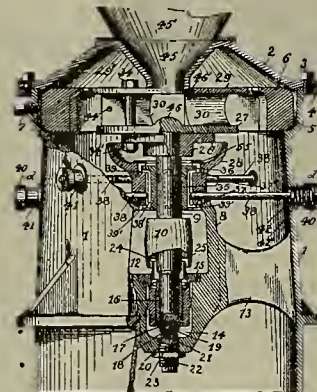
MACHINE FOR SEPARATING GOLD FROM SAND.—No. 785,819; C. O. Michaelsen, Salt Lake City, Utah.



Combination with vertical shell, built of any suitable material, with cap, and concave bottom; of rotatably movable and vertically adjustable worm cylinder, provided with two concavo-convex screw blades, firmly attached on outside of cylinder and starting from opposite sides of cylinder; cylinder being provided with ingress ports in its wall, and fun-

nel firmly attached to and forming bottom of worm cylinder, to which funnel are firmly secured at varying distances agitating arms of suitable length, and bent to correspond with concave bottom of shell, and curved in direction of motion of screw blades.

ORE PULVERIZING APPARATUS.—No. 786,088; E. H. Benjamin, Oakland, Cal.



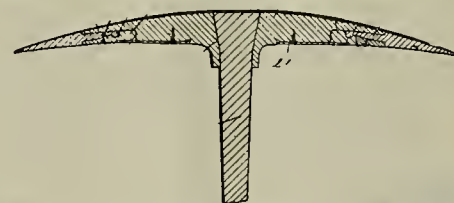
In apparatus for described purpose, combination with shell or casing, of central guide pillar within shell or casing, oil well in lower end of pillar, adjustable plug working through bottom of pillar, central drive shaft working within pillar, universal ball bearing joint between lower end of drive shaft and adjustable plug, thimble fitted within oil well, convex bearing sleeve secured to drive shaft to work against thimble, spring held bearing interposed between upper portion of drive shaft and central pillar, means for exerting lateral spring pressure tension on floating bearing, and devices carried by drive shaft for creating upward air draft through bearing during rotation of shaft.

PROCESS OF REDUCING ORES.—No. 786,051; D. R. Robertson, Leadville, Colo.



Process for reducing ore, which consists in subjecting finely divided material in presence of water to action of sodium salt and potassium salt, heating and agitating mixture, adding salts of iron and acid and again agitating mixture, allowing mixture to rest, and removing separated values.

PICK.—No. 786,207; W. F. Gillooly, Coalton, W. Va.



Head for picks comprising body portion having socket therein for reception of handle and including laterally extending arms, arms having sockets in ends and having recesses therein communicating with sockets, points having stems engaged in sockets and extending into recesses, stems having upwardly extending lugs at free ends, latches removably disposed in recesses and having notches therein in which lugs are engaged to prevent disengagement of points, arms having depressions therein communicating with recesses, springs disposed in depressions and extending over recesses and lying in engagement with latches to hold latter yieldably in engagement with stems, and screws passed through springs and engaged in arms, screws being adapted for operation to permit of lateral movement of the springs to disengage them from latches.





### The Living Witness of the Desert's Tragedy.

In time to come, when new Nevada has reached a stage of development and repose, we can imagine her, when thinking of the loved ones she would honor or whose deeds she would commemorate, saying:

I dreamed last night of a dome of beaten gold  
To be a counter-glory to the Sun;  
There shall the eagle blindly dash himself,  
There the first beam shall strike, and there the moon  
Shall aim all night, her argent archery;  
And it shall be the tryst of sundered stars,  
The baunt of dead and dreaming Solomon;  
Shall send a light upon the lost in hell,  
And flashings upon faces without hope—  
And I will think in gold and dream in silver,  
Imagine in marble and in bronze conceive.

Within the limits of the shadow of such a dome, on a pedestal of silver, an eternal place has been earned by our four-footed friend whose picture heads the article and whose merit and worth have been belied or belittled by the poet who said, "A fellow feeling makes us wondrous kind," by the philosopher who said, "Spirit that lurks each form within, beckons to spirit of its kin," and by the general indifference to the important part he has played in the development of Nevada. With the exception of the Comstock, there is no mining camp in the State that does not owe its discovery, directly or indirectly, to the so-called vagaries of our friend, but in reality to his courage, patience and ability to suffer the tortures of hunger and thirst that drive men mad.

In palatial homes in Eastern cities fair women are decorated with wondrous jewels whose marvelous beauty mocks the sunlight. The palace, the jewels, even the women, would not be so assembled but for the part played by the burro in the discovery of Tonopah.

Other animals have been, and still are, worshipped for services to man less conspicuous than the carrier of a Savior, or the only possible companion of the dauntless prospector of Nevada's deserts. It may be that to acquaint the world with the merits that have been so long hid by time and fate is no small part of the mission of new Nevada, herself representing in all past time Mystery. G. McM. Ross.

GREAT STRESS is laid on the output of some mines by promoters and others, and usually the output is looked upon as having greater significance than it actually possesses. It is the net, and not the gross, output that is of importance. There are some mines making large output, but at a loss; still the figures of output are used to the disadvantage of unsophisticated investors, who look to the gross production only. The operating expense of a mine is as important as the gross output; but those not actually engaged in mining often overlook this important fact.

WHERE mine cost sheets will show, for instance, that during a certain month 20,000 tons of ore was shoveled for, say, 15 cents per ton, and the following month the sheets show that the cost was 2 cents greater per ton than before, it is the duty of the managing engineer to investigate this small detail. Some men consider it a trivial matter, but 2 cents per ton in this case represents nearly \$5000 per year, and, if the manager does not make it his business to look after these small things, they may pass unnoticed.

WHERE trained mining engineers have not held the reins and personally directed the destinies of the properties under their control, little advancement has been made in the past or at the present time. In some mining districts of the world practical miners, without scientific training, have had complete charge of every department of the mining industry, and in these districts things are done to-day just as they were done 100—yes, 300 years—ago; no better and no worse.

## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The United States Geological Survey has taken up the matter of investigating the black sands of the various mining States of the West, with a view to ascertaining what values, if any, are contained in them. Dr. David T. Day of the Survey has been in California making arrangements with the manufacturers of the various types of concentrating machines to send their machines to Portland, Or., to be used in the trial, where careful and exhaustive tests will be made on the black sands from many localities. The dredgers of California produce a large amount of this heavy concentrate, and several carloads of sand will be shipped from Oroville, Folsom and other districts in California to the Portland Exposition for test. It is the desire to test the sands for the rare metals, as well as platinum. Among the minerals it is hoped to discover in paying quantities are gold, monazite, zircon, etc. The concentrating machines will be employed in a competitive test, it being the purpose of the Survey to determine what may be accomplished with each machine without making unfair comparisons. For the purpose of this important investigation Congress has appropriated \$25,000. Sands from other States, as well as from California, are to be collected and tested at this plant.

During the St. Louis Exposition elaborate tests were made of the coals produced in the United States, \$70,000 having been appropriated for this purpose. The results of these fuel tests proved of such importance that an additional appropriation of \$202,000 has been made by Congress to continue this investigation, and W. E. Parker of the United States Geological Survey is now in San Francisco, Cal., with a view to making arrangements to have considerable quantities of the coals produced in the Pacific coast States shipped to St. Louis, Mo., for the purpose of test by various methods, including briquetting, which some of these coals require, owing to their soft and friable nature.

### ALASKA.

F. Hammond has fifty men at work in the Sheep Creek mines, 4 miles southeast of Juneau. The mill has been started.

T. J. Sweeney of the Grindall M. & S. Co. is at the company's holdings on Prince of Wales island, to renew development work.—The 5-stamp mill at the Goldstream mine on Gravina Island, 3 miles south of Ketchikan, has been started up by Miller, Irving and Brice for a test run.—The work at the Sultana property at the head of Hetta Inlet, in the southwestern part of Prince of Wales island, is in charge of C. E. Buttrick. The ore is low grade, carrying gold, copper, silver and nickel.

### ARIZONA.

(Special Correspondence).—Fifteen-cent copper has spurred the country's copper producing mines on to greater production. In Arizona all the large producers are preparing for an increase. The Phelps-Dodge smelters at Douglas are now turning out 8,000,000 pounds per month, and are increasing their capacity to 10,000,000 pounds per month this summer. The Calumet & Arizona and other Bonanza Circle properties at Bisbee are preparing for a large output. The five Circle properties hope to be turning out 10,000,000 pounds of copper per month within two years. The Old Dominion is preparing for an output of at least 30,000,000 pounds per annum, and within two years may increase this to 40,000,000 pounds—and by that time the Arizona Commercial Copper Co., which is connecting up immense ore bodies at Globe, adjoining the Old Dominion, expects to be a factor. If these companies increase this production as they plan to do, Arizona should lead in copper production by 1907.

Bisbee, April 4.

#### Gila County.

(Special Correspondence).—It is hoped that the new plant of the Old Dominion Co. at Globe will be running by June 1. The new plant would have been completed by May 1 had it not been for the washouts. The concentrating mill is about finished. It has a minimum capacity of 250 tons per day, but it can be increased to 1000 tons. Three furnaces in the smelter are in operation and a fourth furnace will probably be added. Self-weighing hoppers have been put at the ore and coke bins, and automatic feeders at the furnaces. These automatic appliances will reduce costs two-thirds. The Old Dominion should produce 30,000,000 pounds of copper per annum from the operation of three furnaces.—It is expected that by April 10 repairs will be completed on the 10-stamp mill of the Lost Gulch mine, owned by E. F. Kellner of Globe. The recent heavy rains have caused about \$1000 damage to the workings.

Globe, April 3.

E. F. Eisenhour, superintendent of the Rye C. Co.'s property, in the Mazatzal range,  $\frac{1}{2}$  miles west of Rye, is driving a tunnel to cut the ledge at a depth of 700 feet. The tunnel is in 200 feet.—The shaft on the Whelan and Sidnor & Stearns property, at the head of Pinto creek, near Globe, is to be continued to the 350-foot level.

#### Maricopa County.

(Special Correspondence).—The Oriental Copper Co. will start work on their property in the Cave Creek district. Heavy rains have delayed work on all properties at least two months.—R. E. Humpbreds of Morristown has sold claims near that place to Eastern parties, who will commence work within the next two weeks.—The mill at the Relief mine has resumed work, as a supply of fuel has been obtained since the heavy rains, and there is now but little mud on the desert roads.—S. W. Haines, from the White Tank mountains, reports the work at the Gila Gold Lode as progressing well.—The Lime Creek Copper Co. have sold their property on

Lime creek to Kentucky parties, who will erect a smelter somewhere in the Cave Creek country.

Phoenix, April 3.

(Special Correspondence).—J. V. Creath has found good ore near Frog Tanks on the Agua Fria.—Veltz & Son intend to put in a small mill on their gold property in the White Tank mountains, north of Buckeye.—L. R. Legier, who has been doing some work on a lead property northwest of Phoenix, reports the find of considerable carbonate ores.—C. Francis, T. Trook and S. Rogers of Morristown are working copper properties.—T. J. Sparks has put in a hoist on a gold and copper property east of Morristown.

Phoenix, April 5.

#### Mohave County.

Superintendent O. F. Kuencer of the German-American M. Co., at Acme, expects that within sixty days the property will be producing bullion.—L. D. Godshall has returned to Kingman from Needles and Los Angeles, Cal., where he negotiated for the purchase of the Needles smelter and the holdings of the Fletcher M. Co. The smelter will be overhauled and its capacity increased. A roaster will also be put in and the smelter will be blown in. Contracts are to be let on the Twins mine to open it.—T. P. Lamb has a bond on the New Jersey mine at Cbloride, and has started work.

The association of mine owners of the San Francisco mining district was formed "for the purpose of fostering, protecting and developing the mining industry in the district." It will endeavor to have a standard gauge railroad built in the district, and to procure pipe lines for water and for oil for the delivery of fuel and water direct to the mines. A secretary is to be elected by the association, to whom all persons desiring employment must apply. If the secretary finds the applicant of good character and well qualified to fill the position asked for, a card will be issued to him, which will enable him to secure employment when there is a vacancy reported by any member of the association. This card will be taken up by the foreman or superintendent when the holder is employed, and returned to the secretary of the association. When a man changes employers he must secure a new card. There is no expense attached to securing one of the above cards. The card system will become effective April 15, 1905, and applies to those now employed. The following scale of wages and regulations have been adopted by the association:

	Per Day.
Sinking wet shafts with machine drills.....	\$4 00
All other mining with machine drills.....	3 50
Mining in wet shafts by hand drills.....	3 50
All other mining by hand drills.....	3 00
Skilled blacksmiths.....	4 00
Tool sharpeners.....	3 50
Hoist engineers, 12-hour shifts.....	4 00
Hoist engineers, 8-hour shifts.....	3 50
Timber men.....	3 50
All laborers, muckers and trammers.....	2 50

All underground work to consist of eight hours actual labor, the men to be lowered and hoisted on their own time; nine hours to constitute a day's labor on the surface.

The above scale will govern all contracts. It was signed by the Gold Roads M. & E. Co., B. Richards, Blue Ridge G. M. Co., Victor & Virgin M. Co., Navy M. & M. Co., German-American M. Co., Gold Star M. Co., J. M. Day M. Co., Gold Giant G. M. Co., Swiss-American M. Co.

#### Pima County.

(Special Correspondence).—D. S. Rose of Milwaukee, president of the Twin Buttes M. Co., has proposed to Tucson to build a custom smelter to handle the output of the Twin Buttes property and others adjacent to Tucson. It is estimated that the Twin Buttes property could furnish 100 tons a day to such a plant.

Tucson, April 3.

It is stated that the directors of the Tip Top M. Co. in Santa Rita district intend to build a railroad 18 miles from the mines to Vail's station. A steam dredger is being put on the Ensenberg placers near Greaterville.

#### Yavapai County.

(Special Correspondence).—After remaining idle for several years, the Storm Cloud mine, which adjoins the Senator and Cash, near Prescott, is being unwatered preparatory to being examined.

The Hector group, in the Hassayampa district, near Harrishburg, is showing good ore under the work of Marsh & Martin.—Good strikes have been made at Camp Columbia on the Bear claims, and they propose to sink 100 feet, then drift and crosscut.—Employment of non-union men at Jerome is threatening a strike in the works of the United Verde Copper Co. Recently thirty-three men in the shops walked out because the foreman, M. J. Foley, was discharged and a non-union man from Pueblo put in his place. The men refused to work under the new foreman and men were at once brought from Pueblo to take their places. It is hard to tell how widespread sympathetic strikes may become among the other workmen at the United Verde, but several union machinists have left their work because of the boilermakers' dispute. Senator W. A. Clark, owner of the United Verde, is expected in Jerome soon and will doubtless find means to avert a general walkout.

Prescott, April 4.

As a result of an explosion in the United Verde mine, at Jerome, five men were killed and seven injured on April 2. The accident happened as the shifts were being changed, and all the men except twelve had been raised to the surface. They were waiting at the station on the 300-foot level to be hoisted from the mine when the disaster occurred. For six years the sulphur in the ore in various parts of the mine has been on fire, but confined to small areas by cement bulkheads that were constructed three years ago. It was believed until this morning that those had solved a serious problem. On account of recent heavy rain, the surface water flowed down upon the burning area, causing the steam thus generated to blow out the bulkheads. That part of the mine in which the accident took place has caved all the way to the surface. The twelve miners who were waiting for the cage on the 300-foot level were suffocated by smoke and steam. It is feared that the fire will spread to the other parts of the mine and cause millions of dol-



lars' damage. Unless checked, it will affect the ground on which stand the immense smelter and power house. The dead are T. W. Crofut, E. R. Ruffin, P. D. Seder, A. J. Halladam and J. M. Roe. The injured are N. Nevonich, B. Garcia, J. Koscie, J. P. Roe, B. Caropa, J. Wilovich and M. Sullivan.

It is reported that the mill at Mt. Union, near Prescott, on the properties of the Mt. Union Con. M. Co., will start April 10th. The starting up of this mill has been delayed by storms of the past three months.—G. W. Middleton will start work on the properties of the Metals M. Co., near Walker.

G. W. Hull, manager of the Cleopatra C. Co., near Big Bug, is reported as having said that within six months he would have a 100-ton smelter reducing ores from the Cleopatra mine. It is to be placed east of the mouth of the Dillon tunnel and below the road leading to that tunnel from Jerome.

## CALIFORNIA.

### Amador County.

It is reported that S. K. Thornton of Plymouth will reopen the Elliott mine at Oleta and put up a 10-stamp mill on the McKinley mine.—A rock breaker and air compressor have been put in the Keystone mine at Amador.

### Del Norte County.

The Klamath River Dredge M. & D. Co. has been formed by J. B. Dougherty and B. O. Tupper to dredge 2100 acres, from the mouth of the Klamath river 22 miles inland.

### El Dorado County.

The Granite mine, near Smith's Flat, has been sold to W. F. Almy of Boston, Mass.

It is reported that the Rosecrans Co. will resume work on their mine, near Garden Valley.—The new mill at the Live Oak mine on Reservoir hill, near Placerville, has been completed by Muller & Cardner. They have encountered some good gravel in their 500-foot tunnel. J. O'Brien of Plymouth is superintendent. It is thought Portland people will put up a mill on the property.—A London syndicate has leased the gravel properties of the E. D. W. and D. G. M. Co. of Placerville and, as the El Dorado Gravel Mining Syndicate, will begin operations at once. The Excelsior, south of Placerville, will be opened up first. A. B. Gould has charge.

### Inyo County.

Work has been stopped on M. Junghandel locations, near Big Pine, until a force pump can be put in to handle the water. The incline is down 50 feet.

### Mono County.

The small quartz mill which Davidson & Lockwood have been building on Missouri Flat, near Bridgeport, has been completed and will be run by water power from the Strosnide ditch.

### Nevada County.

The Home mine at Nevada City has started work in every portion of the mine with the exception of the disputed property. Judge Seawell of the Superior Court of San Francisco has accepted a bond of \$10,000 furnished by the Home Co., which releases the attachment on all the personal property except some broken ore in the mine, which has not yet been hoisted.

Superintendent Klewes will resume work at the Ironclad mine, near Rough and Ready. He will put in a complete electric pumping and hoisting system to replace the steam power, which was in use until the mine filled with water and shut down last winter.—Superintendent Dunlap reports a rich strike at the Lecompton mine in the Willow Valley district, near Nevada City.

### Placer County.

It is reported that the Black Canyon quartz mine, near Indian Springs, will start up May 1.—The Red Point mine, near Damascus, is being worked on a small scale, six men working there on a lease.—The Salvation mine, at Sailor Canyon, has stopped work.

### Plumas County.

The Red Slide mine, near Eclipse, is owned by Geo. Sanborn, who is driving a hedrock tunnel to strike the gravel channel.

### Sacramento County.

The El Dorado Gold Dredging Co.'s dredger, near Folsom, is completed and will be in operation within two weeks.

### San Diego County.

The bondholders of the California King Gold Mines Co., whose property is situated in Picacho basin near the Colorado river, about 30 miles north of Yuma, threaten to foreclose unless the accumulated and overdue interest is paid promptly. It had been expected to raise upwards of \$40,000 from sale of bonds and by other means with which to carry on the more extensive development of this large property. The management of this property has from the start had many difficulties to overcome. It is situated in the Colorado desert, and the only favorable feature of its location is the proximity of the Colorado river, which affords abundant water supply, though every ounce used has to be pumped. B. Moody, formerly chief engineer of the Homestake at Lead, S. D., took the management of the property in the summer of 1904, and after making some changes in equipment succeeded in getting the most satisfactory run ever made at the property, producing, it is reported, \$64,000 in four months. On this showing the directors have hoped to float more bonds to secure funds to clear the indebtedness, and place the mines on paying footing. While no definite plan has yet been adopted as to how the properties will be sold, in the event of foreclosure proceedings becoming necessary, it is understood that the bondholders will apply to sell the property to indemnify themselves, when a new company will be organized. Those holdings bonds of the present issue will secure an interest of some kind in the new company, while all the stockholders who have no bonds will not be recognized in the new organization.

### Shasta County.

D. B. Hunt of Redding and J. Sallee of San Francisco have struck high-grade ore on the Reid mine in Old Diggings district.—Work on the new 4-stamp mill being built on the John Larkin mine, in the Centerville

district, is nearly completed.—E. P. Conner and J. R. Conner have sold the Montezuma mines, near Shasta, to the Gold King M. Co. C. Johnson of Los Angeles is president and R. K. Morris secretary of the Gold King M. Co.

### Sierra County.

At the Mt. Lion mine, near Pike City, a rich strike has been made by W. H. Wayman and F. G. Low.

### Siskiyou County.

The steam machinery of the dredger in Yreka creek, at Hawkinsville, has been removed and the electric power machinery is being put in. The company is working Yreka creek from Shasta river to Yreka.—The rain of the past few weeks has enabled the hydraulic and placer claim owners to start work again.—G. W. Grayson of San Francisco, owner of the Mono quartz mine on Humbug, is making arrangements to put up a 10-stamp mill during the summer.

### Tehama County.

(Special Correspondence).—The Bazler Copper Co., operating mines 30 miles west of Red Bluff, is working eight men on development work. The vein is cut by a crosscut tunnel nearly 800 feet in length, developing from 12 to 40 feet of copper bearing ore, carrying also gold and silver values. A carload shipment was made recently to the smelter. It is expected to ship 150 tons weekly after May 1. The haul from the mine to the railway costs from \$3 to \$5, according to the state of the roads and weather. The company is considering the placing of traction engines between the mines and railroad. This is the only operating mine in Tehama county.

Red Bluff, April 4.

### Tuolumne County.

D. L. Oneto has sold to H. S. Hale one-half of the Gold Flake quartz mine and millsite near the mouth of Mormon creek, near Tuttle town.—A. M. Divoll has sold to L. R. Fulcher a one-sixteenth interest in the Frisby Annex quartz mine, near Sonora. M. Harmon previously deeded to Divoll a half interest in said mine.—The owners of the Bell mine, near Tuttle town, have taken over the Bell mine from the El Rico M. Co., who had it under a bond.—R. T. Whitto has deeded to E. R. Bolton of Jacksonville the Gladstone quartz mine.

### Yuba County.

The Hammon dredge mining interests along the Yuba river have been consolidated and reorganized under the name of the Yuba Consolidated Goldfields. The capital stock is \$12,500,000. The principal place of business is Portland, Me. E. F. Sweetzer is president and L. L. Hight secretary.

The 20-stamp mill formerly operated at the Browns Valley mine has been sold to the North Star M. Co. of Grass Valley.

The Marysville Gold Dredging Co. will commence building two mining dredgers just as soon as the water in the Yuba river is low enough to permit the pits to be evacuated. The dredgers will be of the same type as those in use at the Yuba Con. Gold Fields adjoining the Marysville Gold Dredging Co.'s holdings on the east. W. P. Hammon of the Gold Fields property will be the managing director of the Marysville Co. and R. E. Cranston will be superintendent. The first work to be done by the dredgers will be that of building the two training walls contemplated in the Government plans for correcting the Yuba river and giving it a straighter and better defined channel from Daguerre Point to Marysville. This work will consist of two walls aggregating several thousand feet in length, and enclosing between them a canal which will constitute the new channel of the river. As the walls on each side will be 30 feet high, the water will be confined in the channel and will scour the bottom, sluicing it out and lowering the bed of the river with every freshet.

A. F. Eaton of San Jose has bonded for Chicago, Ill., capitalists 3000 acres of land 6 miles east of Marysville, on the south side of the Yuba river, for dredge-mining purposes, and will put three drills at work.

## COLORADO.

### Clear Creek County.

Manager G. W. Teagarden of the St. Paul M. Co. at Georgetown is completing arrangements for machinery for the new power plant and for machine drills. The company has started a tunnel to open up the veins of Green Lake mountain.—J. G. Roberts has sold to J. Morton of Georgetown a one-fourth interest in the Blue Ridge millsite and Capital ditch, giving Roberts the ownership of the entire property. A sampling works plant has been put in at the mill.—The Capital mill is treating twenty-four tons of ore daily. It is thought that an electric motor will be put in to take the place of horses on the tramway.—The two deep workings of the Mineral Chief vein are being pushed ahead by Manager W. C. Hood. The lower drift from the Moline tunnel is in 185 feet from the tunnel and 639 feet from the portal of the tunnel. This drift will open up the ore shoot 500 feet deeper than the upper workings on the Mineral Chief. The level from the Spartan drift is in 143 feet from the crossing of the veins and 283 feet from the surface.

### Chaffee County.

The Latchaw G. M. Co., on Mount Princeton, near Hortense, has its tunnel in nearly 3000 feet. An aerial tram 7000 feet long is to be built to connect the tunnel with the "transfer," 1½ mile below where the power now is, compressed air being conducted to the mine by pipe line. The company will put in an electric power plant on Chalk creek at the Cascades, the tunnel leading the water through the mountain already having been completed. This will furnish the power needed for the mills they will build. C. I. N. Sharp is manager.—The Stratton-Massachusetts G. M. Co., 5 miles east of Buena Vista, under the management of N. A. Stratton, has a portion of the material for the new mill on the ground.—In the Four-mile district, 2 miles from Buena Vista, the Centennial is being put in shape by F. Denman of Colorado Springs. It is being unwatered and retimbered.—The Sunshine mine, near the Centennial, has begun work.

### Hinsdale County.

Snowslides near Lake City have caused temporary stopping of work at the Big Casino and at the Easy Creek, at the head of Cooper creek.—A. G. Wood and associates, who are leasing on the Golden Fleece, have ore ready to ship. Milling ore will be handled as soon as the weather settles.—The Golden Fleece (eighteen claims) are on Hotchkiss mountain, 4 miles south of Lake City, in the Lake district.—It is reported that W. S. Whinnery will reopen the St. Jacobs mine at Carson.

### Lake County.

(Special Correspondence).—During March the Leadville mines shipped 78,000 tons. The Western M. Co. shipped 15,000 tons, of which 7000 tons came from the second contact ore bodies in the Coronado. The Iron Silver M. Co. shipped 12,000 tons from the Moyer group. The output of the Western Company is expected to be increased when the three new pumps are put in at the Penrose. The Coronado pumps are now lifting 1200 gallons a minute, and the Penrose pumps 1400 gallons or 2600 gallons from these two shafts. These new pumps have a capacity of 900 gallons a minute each. When they are started, over 5000 gallons a minute will be pumped from the Downtown mines, and development, which has been hampered by the water, will be pushed.—Reports from the Mosquito district state that a new body of ore has been opened in the London mine. J. M. Kuhn is manager.

Leadville, April 3.

At the Boswell placer, near Twin Lakes, a flume will be built to connect with 600 feet of 10-inch pipe line, giving a 300-foot fall for hydraulic giants. L. Foster will have charge.

### Ouray County.

Manager Manion, of the Brooklyn mine, in the Red Mountain section, states that the working force is to be increased and shipments of ore will be resumed.

The outlook for the Revenue mine at Ouray is better than it has been for years. The force has been increased by seventy-five men, making 275 in all. It is reported that within sixty days more the force will be increased to between 400 and 500. The water, which has been giving them so much trouble, is under control, since the new, large pump has been put in.—A shipment has been made by the leasers on the Hoosier Girl, one of the Camp Bird Extension group.—W. R. Kramer has a lease and has started work on the Governor, on Stoney mountain near Ouray. A mill was put on the property last fall, and good results were obtained from it until they were compelled to shut down on account of lack of water.—Griffith & Fuller, who are leasing on the O. & N., have opened up a large body of low-grade ore on that property.

A snowslide at the Banker National tunnel, near Camp Bird, in the Mount Sneffles district, on April 1, caught six men and killed two.

### Park County.

(Special Correspondence).—The London mine at Alma is shipping 15 to 20 tons per day. J. M. Kuhn is superintendent. Development on this mine consists of 2700-foot drift on south side, about 3000 feet on north side, with 300-foot raise from south drift to connect with north side, making ventilation good. This mine is on the London fault, which can be traced for 12 miles.—Superintendent E. P. Ibsen of the Paris mine on Mt. Bross, near Alma, is working a few men and has all available room filled with ore.—The Dolly Varden on Mt. Bross, C. D. Hall superintendent, is closed on account of snow, but will be worked when the weather settles.—The Kansas mine, above Montgomery, is being worked by Clark & Eddy Bros. under lease. They have some good ore and will begin shipping as soon as the trail improves.—The Wheeler mine on the head of the South Platte, under lease to Eldridge, Kuhn & Anderson, is shipping. This ore is packed out by jacks, 11 miles.—The Old Moose mine has three men doing development work.—All these mines are at or above timber line on the Continental divide. Timber line here is about 12,000 feet above sea level.

The Snowstorm Hydraulic Co. have one churn drill at work testing the gravel on the Snowstorm claim. Surveyors are at work on the high line ditch for a better water supply on the Alma claim.—The Beaver Creek claim is not being worked at present. The Snowstorm and Alma will be working full force as soon as spring opens.—The Cincinnati P. M. Co. are not doing any work, although reports say that they will start soon.

Alma, April 1.

### San Juan County.

The boiler and engine-room and the blacksmith shop of the Iowa M. Co. in Arrastra gulch, near Silverton, were wrecked by a snowslide on April 1. The mill was covered with snow and the tailings plant destroyed.

### San Miguel County.

A dynamo and blower are being put in to give air to the Pennsylvania tunnel, which is being run to cut the Smuggler vein, under contract by the Goldfield Rex M. Co., under the supervision of A. A. Clute of Telluride. This company also has a lease on ground which they propose operating when the vein shall have been cut.

The Bohtail snowslide near the top of Ajax Peak partially destroyed the Smuggler Union tramway. The 74-foot tower on the bank of Marshall creek was knocked from its foundations. The men employed by King & Lindsey and the Telluride Leasing Co. on the Smuggler Union mines have been temporarily discharged.

The Invincible G. & S. M. Co., of which J. A. Ross of Denver is general manager, will work on claims in Navajo basin, Mount Wilson district, as soon as trails leading to the property are passable. The main tunnel is to be driven 30 feet, to intersect the vein of the Zero.—The recent snowstorms have interfered with the plans of some of the mine operators relative to increasing their working forces, and the increase expected about the 1st of April will not occur until about the 15th.—Wagner Bros. will put additional men to work on their leases on the '76 mine, one of the Smuggler-Union properties, and the Smuggler, Union and Sheridan dumps. Operations on the Keystone placer have been set back, and Superintendent Harris has not been increasing the force as expected.



## Sammit County.

The North American Mines Co., operating at Curbin, in the Ten Mile district, has laid out a new tunnel location to cut all lodes at the greatest possible depth, leaving sufficient elevation for a mill close to the railroad. —At Frisco the Copper Queen mine, now being operated by the Mary Verna M. Co. of Memphis, Tenn., is being developed by a tunnel, which is in 320 feet. —The Washington-Joliet Company on Nigger hill, near Breckenridge, is employing thirty men, blocking out ore to have an ore reserve when the mill, now being repaired, is ready to resume operations.

The Gold Dust Mines Co. has been formed by M. W. Hoyle, E. J. Hoyle and R. R. Kirk at Breckenridge.

## Teller County.

The production for March in the Cripple Creek district was as follows:

Name of Plant.	Tons.	Av. Value.	Total.
U. S. Reduction & Refining Co. ....	25,000	\$30.00	\$ 750,000
Smelters .....	2,500	60.00	570,000
Portland .....	7,800	30.00	234,000
Economic .....	3,000	35.00	105,000
Dorcas .....	3,500	32.00	112,000
Wild Horse .....	2,400	6.00	12,000
Anaconda .....	1,400	7.20	10,080
Other cyanide plants .....	1,000	6.00	6,000
Totals .....	53,800	\$35.90	\$1,829,080

Shipping has been resumed from the Gold Sovereign mine at Cripple Creek by Manager W. F. Rock. The new ore house can handle 100 tons a day. An east and west vein has been opened in the bottom level at a depth of 700 feet. Ore is being broken in the main shoot, 200 feet south of the shaft, on the 700-foot level, where the Gold Temple Co., former lessees, left off. The bottom of the shaft is 40 feet below the 700-foot level. The objective is 800 feet, where a crosscut will be started to reach a possible extension of the Triby shoot.

The Geneva, on Gold Hill, Cripple Creek, has been leased by the Stratton estate to an operating firm, including F. Welland, H. D. Warmuth, J. Hull and Wm. Catlin. They are arranging for putting in a 12x12 hoist. The shaft is 600 feet deep. —At Cripple Creek the Pharmacist Co. has granted a lease on the southern end of its Bull hill property to F. M. Gilbert, who will commence work at the bottom of the shaft at a depth of 660 feet, and from this depth will drive a number of drifts to the side lines of the ground under lease. The lease calls for the sinking of the shaft another 150 feet. —Lessee Smith, operating on the Sentinel claim of the Twin Sisters Company, has stopped work because of the immense amount of surface water due to the melting of the recent heavy snowfall. When operations are resumed, drifting will be started.

Leases on the Stratton estate property have been granted to R. P. Russell, A. T. Holman, F. M. Kurie, J. M. Roach, president of the Chicago Tramway Co., A. Cornforth, R. H. Hefley, W. A. Matlock, C. Waldron, F. V. Bodfish, C. L. Lightburn, J. P. Bates, C. H. Starkweather, J. Finn, W. H. Tuttle, G. Davis, J. W. Newell, F. H. Bostwick, T. S. Rhett, W. A. Kelly, G. A. Stahn, E. M. Pollins, J. M. Wright, R. K. Hutchin, W. F. Jones, W. H. Fitch, T. Kelly, J. W. Huffaker, N. Franklin, G. Bernard, W. Bainbridge, J. F. Shafroth, J. B. Board and M. V. Andre.

An ore shoot 68 feet from side to side is being worked by Lessee Walsh on the Forest Queen mine on Ironclad hill, Cripple Creek. The operators are preparing to increase their boiler capacity, and when this is completed they will sink an additional 100 feet, which will give them a total depth of 875 feet, besides allowing them to increase their shipments. —As soon as conditions will permit, the work of installing machinery at the Empire State shaft of the Isabella Co. at Cripple Creek will be started. The machinery ordered includes a first motion hoist, good for a depth of 1500 feet, and a Norwalk air compressor. As soon as this machinery is put in place it is the intention of the operators to sink the shaft another 400 feet.

## IDAHO.

## Blaine County.

C. Johnson, superintendent of the Drake Mines Development Co., has started work at Skeleton creek, near Hailey. The company will build a mill upon its property this summer, and R. P. Chattin & Co. and the Mountain Home Co. also intend to put in mills this year. When these three mills get to their regular work, the bullion output will demonstrate the value of the district.

J. Williams, manager of the Wood River Zinc Co., says that the company will buy all argentiferous galena and zinc-lead ores offered after the mill has been working awhile.

## Idaho County.

C. W. Smith of Newsome, resident manager of the Anaconda group, near Newsome, reports that the property has been bonded to Eastern capital represented by W. L. Stevenson of Spokane. The property will be incorporated as the Graham M. & M. Co. A mill will be shipped in as soon as conditions of the roads will permit. —J. A. McEachron, manager of the Elk Gold Co., will begin work on the Albertas group, near Elk City.

## Kootenai County.

The act of the Idaho Legislature dividing Kootenai county into Lewis and Clark counties has been declared unconstitutional.

## Shoshone County.

J. Morrow and W. S. Wilkinson have been developing the Wild Rose, near Pierce City, and state that they have tapped a good vein of rich ore by a new drift into the shaft and have also made a new discovery a short distance from the Wild Rose lead. The Wild Rose mill will be started about July 1. —The Laclede M. Co. will put in an air compressor on the property, near Wallace, as soon as the weather conditions will permit. The company is running a 700-foot tunnel which will give depth 200 feet below the upper workings. —The prospecting work on the California and Black Cloud properties and the Pan Handle on Nine-Mile creek, 2½ miles from Wallace, has proven satisfactory, and development work has been started by the Heins Silver & Lead M. Co. under superintendence of C. H. Maiden. J. H. McClarren of Pittsburg, Pa., a stockholder, has been at the mine. —J. McLaren has started a lower tunnel to develop the

Ruth vein, near Wallace. O. Wallace of Spokane is manager of the Ruth M. Co. —J. L. Safford and G. Safford of Spokane are sluicing in Milo creek, near Wardnor. —Wardner reports say that the long tunnel on the New Jersey property, near Big creek, is in 500 feet. Bell Bros. of Big creek have the contract for 1000 feet of tunnel. —Work has again been started on the Western Star property on Big creek. The tunnel is in 900 feet and has some good looking ore in the face.

The Snowstorm copper mine, near Mullan, is building a leaching plant for treatment of its second-class ores. The upper level is under lease to J. H. Howard & Co. At present 100 tons are being shipped daily to the smelters from the upper works. A large body of good shipping ore was opened up in the 1000-foot level last fall, but to date no shipments have been made from this level. An aerial tram brings the ore down from the mine 1½ miles. The property is a fine tunnel proposition, affording large stoping backs. —The Iron Spar Copper M. Co., southeast of the Snowstorm, have opened good values on their copper vein. J. J. Curran is president of the company. —It is reported that the Custer mine, on Custer peak, between Wallace and Murray, will resume shipping.

## MICHIGAN.

(Special Correspondence). —The Quincy M. Co.'s smelter at Hancock is working full capacity. The new furnace is giving satisfaction. The Quincy is also hauling the production of the Franklin, Adventure, Mass and Centennial properties. —At the plant of the Michigan Smelting Co., owned by the Stanton-Paine Mines, the difficulties which retarded operations since the furnaces were blown in have been eliminated. The production of the Copper Range Con. mines—Baltic, Trimountain and Champion—is being treated, and upon the expiration of the contracts of the Wolverine, Mohawk and Atlantic companies with the Calumet & Hecla corporation the output from those properties will be handled. The present capacity is 72,000,000 pounds per annum, but the management intends additions which will increase it. The Calumet & Hecla M. Co.'s smelter at South Lake Linden has been treating the product of some of the Stanton mines. —Owing to the withdrawal of the mineral shipments from the Copper Range Con. mines, which were necessarily shipped there during the period of repairs to the Michigan smelter, the Hancock plant of the Lake Superior Smelting Co. has been closed down. —Work at the Franklin mine is still suspended, owing to the strike of the trammers. The management says it is not prepared to meet the higher wage scale demanded and would rather keep the mine idle. —A permanent steel shaft and rock house at No. 2 shaft of the Baltic mine will be built during the coming summer. The Baltic mine has four permanent shafts—Nos. 2, 3, 4 and 5. The three latter are equipped with steel rock and shaft houses, but the new structure at No. 2 will be provided with larger rock bins. Permanent hoisting engines are in service at No. 3 and No. 4, and at No. 2 an engine house has been completed. A double conical drum, high duty hoist for permanent service is ready to be put in. —Work on the Osceola branch of the Calumet & Hecla mine is going ahead steadily at No. 13 shaft, the southernmost opening on that bed, where twenty drills are in service. This shaft is nearly 1500 feet deep. —At the Centennial mine No. 1 shaft is sinking below the twenty-fifth level at a depth of 2800 feet. No. 2 shaft should be completed within six months, solving the ventilation problem. —The March production of the district has been curtailed by labor troubles, which, while not serious at any mine, caused a few days' suspension at a number of properties and reduced the aggregate production.

Calumet, April 3.

## MONTANA.

## Fergus County.

J. A. Drake of New York is expected at Kendall to make plans for development at the North Moccasin property, at Kendall. —President G. M. Nelson of the Chicago-Montana G. M. Co. has made an offer to miners and others who have claims against the company to pay in full and resume operations if they will stay all proceedings for forty days. Within that time a meeting of the stockholders will be held in Chicago.

## Granite County.

Chas. Boyd and Alex. Boyd and Aug. Lindstadt have sold their mine in the Red Lion district to G. H. Savage, of the Milwaukee Gold Extraction Co., for \$9000.

At the Albion mine in Deer Lodge basin, near Princeton, a strike has been made in the face of the main tunnel, which is in 900 feet. F. C. Arnold of Butte is president and H. Hinkle of Butte is secretary. —T. H. Murphy and Charles Bagley of Phillipsburg have a lease and bond on the Schiller & Steinhauser property, near Princeton, and have commenced work.

## Lewis and Clarke County.

The Brooklyn Bridge M. Co., south of Helena, proposes to begin work on a new double compartment shaft 500 feet deep.

The Carbonate Chief, in Warm Springs district, near Helena, is being worked from a tunnel through the Bell mine, and shipments are being made via Clancy to the East Helena smelter. J. Stinbrenner of Helena is the principal owner. —The Howard mine in Grizzly gulch, 2½ miles from Helena, is being worked by Mr. Essler. —The Comet, near Wickes, is being worked under a lease by Gulio, who is shipping thirty tons a day to the East Helena smelter. —The South Bend M. Co. is working its mines on Ten Mile, 4 miles from Rimini. —The dredger which has been built for operation in the Missouri river at French bar, under the supervision of Mr. Reynolds, has made a trial run. —M. Manuel has put in a hoist at the Minnesota, near Wickes, and will sink another 150 feet. —The Edward F. Co., operating near Hassell, will put in a 20-stamp mill and cyanide plant.

## Madison County.

The Green-Campbell M. Co., operating the Green-Campbell and other mines near Silver Star, is considering plans for a stamp mill.

## Silver Bow County.

(Special Correspondence). —The old Colorado S. & M. Co., one of the Amalgamated assets, has gone out of existence, as the Amalgamated Co. has formed the Trenton M. & D. Co. under the laws of New Jersey, to succeed the Colorado corporation. —Mining claims about Butte, the old smelter, and all other assets have been transferred to the new company. —The Amalgamated Copper Co.'s option on the Speculator group has lapsed and it is said that a Duluth company has taken it. The Speculator owns the Speculator, Jesso and the Edith May.

Butte, April 3.

It is reported that high-grade ore has been discovered in the Raven mine in Centerville, 5 miles from Butte, at 700-foot level. The president of the company is C. E. Morris of Pony, Montana. J. Bergin is manager.

## NEVADA.

## Churchill County.

Geo. Abrogast is developing a property near Bernice. Esmeralda County.

(Special Correspondence). —The Mohawk Alpine Co. at Silver Peak have closed down their mill until better water can be piped to the mill from near the Blair mill. —The Combination mill at Goldfield is waiting for water, which is to be pumped 10 miles from an alkali spring through a 3-inch pipe. —The Goldfield Reduction works are almost ready to start their 10-stamp mill. —A new strike of silver-lead ore is reported from Palmetto, 20 miles from Lida.

Goldfield, April 3.

The property of the Cash Goldfield M. Co. is being developed under the management of R. B. Todd of Goldfield. —The Gold Button M. Co. has started another shaft in the Black Cop ground. It will be sunk 40 feet, when crosscutting will begin. —The Kawich-Bullfrog Mines Co. is working in the Kawich district under the superintendence of W. Pike and in Bullfrog under direction of L. C. Beckwith.

The following information regarding Nevada's latest mining camps has been compiled from local papers: Goldfield is 28 miles south of Tonopah; 16 miles south of Goldfield is Tank Springs; 29 miles south is Summerville, the new strike, which is 3 miles west of Thorp's mills; 28 miles south from Summerville is Muddy Spring; 8 miles south from Muddy Spring is Old Bullfrog or Amagosa (now deserted), where the original Bullfrog mine is located. Rhyolite is 4 miles east from the Original Bullfrog mine, a town of 400 population, the center of the Bullfrog district, now about six months old. Bullfrog is ½ mile south. From Rhyolite to Beatty is 4 miles northeast, passing the Montgomery-Edwards mine. South from Beatty 4 miles is Gold Center. —A telegraph and telephone connects Goldfield with the outside world. An electric plant furnishes light for stores and residences. In its first year Goldfield shipped \$3,038,000 worth of ore of average value of \$47.60 per ton. In the same time \$1,208,000 worth of milling ore was placed on the dumps. There are eighteen mines in shipping ore—\$100 per ton or better. Deepest shaft, 315 feet. Area covered by mines producing ore, 12 square miles. Six mills for treating lower grade ores now in process of construction. It is reached by Southern Pacific railroad to Reno, Nevada, and over narrow-gauge railways from Reno to Tonopah, and thence by stage or automobile direct to Goldfield. Railroad fare from Reno to Tonopah, \$17.50. Stage fare from Tonopah to Goldfield (about 25 miles across the desert), \$4. Automobile fare from Tonopah to Goldfield (about 26 miles), \$6. Baggage allowed each passenger by railroad companies to Tonopah, 150 pounds. Baggage allowed each passenger by automobile company, Tonopah to Goldfield, twenty pounds. Baggage allowed each passenger by stage owners, Tonopah to Goldfield, fifty pounds. Time consumed by railroad trip from Reno to Tonopah, 18 hours. Time consumed by automobile ride from Tonopah to Goldfield, two hours. Time consumed by stage ride from Tonopah to Goldfield, five hours. Express (Wells, Fargo & Co.) rate from San Francisco to Goldfield, \$9 per 100 pounds; from Reno, \$7.50. Excess baggage rate, Tonopah to Goldfield, per 100 pounds, \$2. Hauling by mule team, general merchandise, lumber, etc., Tonopah to Goldfield, per ton, \$30. Prices current in Goldfield: Hay, per ton, \$55; lumber, 7 cents per foot; kindling wood, \$18 per cord; kerosene oil, 60 cents per gallon. No coal is used except in blacksmith's forges. Camp stools, 75 cents; kitchen chairs, \$1.50; small kitchen tables, \$5; small kitchen stoves, \$18 to \$40; table kerosene lamp, \$1; mattresses (wool waste filling), \$6; agate tea kettles, \$1.50; coffee pot, \$1. Furnished rooms in adobe houses, \$1.50 per day for one person and \$2 per day for two persons if they occupy one bed. There are half a dozen good restaurants in which prices only about 25% above city prices are in vogue. Fresh milk, 25 cents per quart; Eagle brand condensed milk, 25 cents per can; best coffee, 60 cents per pound; granulated sugar, 10 cents per pound; bread, three loaves for 25 cents; sirloin steak, 30 cents per pound. Boots blacked, 25 cents; shave, 25 cents; hair cut, 50 cents; city prices; all local and out-of-town newspapers, 10 cents; Everybody's Magazine, 20 cents; Harper's Magazine, 50 cents; Puck, 15 cents; MINING AND SCIENTIFIC PRESS, 20 cents. Miners earn from \$4 to \$4.50 per day; laborers, \$4 per day; waiters, \$4 per day and board; porters, \$4 per day; restaurant cooks, \$6 per day and board; bartenders, \$6 per day; clerks, \$4 per day; printers, \$5 and \$6 per day; stenographers and typists, \$90 to \$125 per month; painters, \$6 per day; carpenters, \$6 per day; chaffeurs, \$6 per day.

## Humboldt County.

(Special Correspondence). —Thos. Kinney has located claims on a high-grade gold and silver ledge 5 miles south of Ashdown. —The Pine Forest Gold Co. J. H. Ashdown manager, is working forty men on their No. 10 tunnel being run to cut the vein. —The Vicksburg Denio Gold Co. and the Kentucky M. & D. Co. are doing some work. —W. J. Dakin and F. M. Payne are sorting ore for shipment from their mine 15 miles south of Ashdown.

Ashdown, April 3.



## Lincoln County.

The Searchlight, in describing the Eldorado Canyon district, says that a 325-foot tunnel is being run on the Eldorado vein to meet the working shaft at the 125-foot level. C. F. Lee has charge of the work for C. H. Kelley and C. G. Austin of Seattle, Wash., who have bonded the mine.—M. E. Paddock has charge of the Eldorado property of Miller & Miller of Cripple Creek, Colo.—E. J. Roberts has a bond on the Silver Legion and Good-enough claims, in the west end of the canyon, from J. S. Sartain.—The Knob Hill G. M. Co. has twelve claims south of the Silver Legion. L. W. Walker of Los Angeles, Cal., is manager.—The Poppy and Lombard groups have been bonded by A. M. Jennings and J. M. Evans of Eldorado Canyon.—J. W. Copp and E. P. Jeanes are working the Mountain claims.—The Buster and adjoining claims are being worked by the Black Hawk M. Co., C. E. L. Gresh of Searchlight manager.—C. Clark intends to put in crushing machinery and a cyanide plant to work the Hillside, in Eldorado canyon.

At the Buck mine, near Fay, operations have been resumed, with the management drifting north and south on the ledge.—The Deer Lodge Company at Fay will put in a compressor and machine drills at an early day. The new tunnel is expected to connect with the ore bodies in the next 1200 feet. H. H. McAndrews is manager.

The Los Vegas Times says that the Wilson-Lyons Construction Co. of San Francisco are operating a deposit of sandstone 10 miles west of Las Vegas.—A. M. Jennings, president of the Southern Nevada M. Co., will sink a 500-foot shaft.—C. E. L. Gresh, manager of the Black Hawk M. Co., has found water in his well on the Buster claim and will build a 10-stamp mill as soon as the lumber can be secured at Las Vegas. There are two 85-foot shafts on the Buster, 300 feet apart, with 12 feet of ore, said to average \$20.

## NEW MEXICO.

## Otero County.

The Southwest S. & R. Co. has made plans for a 400-ton smelter to be built at Jarilla. The company owns and controls 600 acres of mining claims at Jarilla and is leasing the ground.—The Kansas City Co. has put men on the Ruby and Monte Cristo claims at Jarilla and has commenced the shipment of ore to the El Paso smelter.—The Nannie Baird, at Jarilla, is reported producing gold ore running \$300 per ton. It is owned by C. B. Eddy and C. D. Simpson.

## OREGON.

## Baker County.

The Columbia mine, near Bourne, has ceased sinking from the 700-foot level and is crosscutting and stopping from upraises. The mill is kept constantly going.—The E. & E. at Bourne is employing the largest crew in the history of the mine and the output of ore is correspondingly large.—The North Pole, below Bourne, has been worked this winter. The hauling of ore to the smelter at Sumpter has been suspended until the roads are in good condition.—The Cracker Oregon at Bourne has been driving its main tunnel on the ledge during the winter. The mill has not been operated during that time.—D. Willard, manager of the Little Cracker, is awaiting good weather before starting work where it was left off last fall. Snow is very deep at this property.

Manager F. S. Baillie of the Columbia mine at Bourne has completed the water power and compressed air plant erected on Fruit creek, a short distance below the Goldconda mine. An air pipe has been laid from this plant to the hoist at the collar of the main shaft. The Columbia has water power, applied directly, for the 20-stamp mill, but has been using steam at the hoist.—Arrangements have been completed for driving 500 feet on the lower Imperial drift at the Imperial property, Cable Cove. The additional work was arranged for following the visit of President A. H. Sibley of Detroit.

Pursuant to an injunction served on the Columbia mine management at Bourne, operations under the contract with the Taber Fraction have been suspended. The latter enjoined the Columbia from extracting ore from the Fraction under the contract pending until an accounting is made of the amount of ore formerly taken out. It is claimed that the Columbia has extracted \$50,000 worth of ore from the Fraction, for which no accounting has been given, and judgment is prayed for in that sum. The Columbia has not suspended work in its own ground.

## Crook County.

The ranch of D. W. Barnett, near Culver, on which petroleum indications were found last fall, has been bonded for \$10,000 to A. Mason and Portland men, who will push drilling. The bond provides that those holding it shall drill not less than 1000 feet inside of one year from the date of the contract.

## Grant County.

Manager J. W. Hughes of the Equity Company, operating in the Quartzburg district, states that the 5-stamp mill of this property is to be started. Most of the development during the winter has been on the Oregon claim.

## Josephine County.

The Scenic mine at Greenback has been purchased by W. H. Brevort and will be known as the Martha mine.—T. J. Mackin and A. J. Bennett have formed the Leland M. Co. to raise money to put a mill on the Golden King quartz mine, 3 miles from Greenback.—It is reported that F. Clemens will start the Yellow Horn mill, near Placer.

## Wallowa County.

The management of the Tenderfoot property, 20 miles from Joseph, is preparing for spring work. The 20-stamp mill, ordered two years ago, will be finished this season.

## SOUTH DAKOTA.

## Custer County.

F. C. N. Graydon of Custer expects his company to resume operations at the Tripoli mine, near Argyle.

## Lawrence County.

(Special Correspondence).—The Oro Hondo Co., whose shaft is near Kirk, a mile south of Lead, are consider-

ing the probable location of the Homestake ore shoot, in its dip and trend into their own property. The Homestake belt undoubtedly extends for miles, but its greatest development, and thus far its greatest value, lies between Deadwood gulch on the north and Gold Run on the south. The several great ore shoots occur along the mineralized zone known as the Homestake belt. These shoots are separated from each other, on the strike of the vein, and occupy various positions in the broad zone of mineralization occurring throughout an area about 2000 feet wide and 6000 feet long. The strike is about 30° west of north, the dip northeasterly, and the trend of the ore shoots, as far as known, is to the southward, at an angle approximately similar to the dip. The Oro Hondo property, being nearly a mile to the southward, the trend would carry the vein well to the eastward, and it seems improbable that the Oro Hondo shaft if properly located can strike the Homestake shoot at a point nearer than 4000 feet from the surface, and it may be deeper. Ore has already been developed in the shaft of the Oro Hondo property, but that it is a portion of the Homestake shoot is improbable. A crosscut to the northeastward would possibly strike ore in greater amount, but such a crosscut run from the present bottom of the Oro Hondo shaft would in all likelihood pass over the Homestake shoot if it goes this far to the southward, but in this development there is always the possibility of striking a new shoot which as yet has remained undiscovered.

Lead, March 26.

Superintendent John Croft, of the Redfern G. M. Co. of Deadwood, will sink from the 100 to the 200-foot level on the property near Redfern station, 25 miles south of Deadwood.—J. W. McClure of Des Moines, Ia., president of the Queen of the Hills G. M. Co., has straightened up the company's affairs and will complete the stamp mill in Whistler's gulch, near Deadwood.—The Imperial Mining Co. is increasing the size of its cyanide plant at Deadwood by the addition of two more cyanide tanks, with a capacity of 275 tons each. The output of the mill for last month was 3200 tons and the increased capacity will bring it up to 4500 tons per month. The capacity of the mill at the present time is 120 tons per day and the new tanks will bring the output to 150 tons daily.

It is reported that sinking will be resumed in the Big Four shaft, above Central City. No underground work has been done by this company since its shaft house burned in December, 1903. The shaft is 170 feet deep. P. T. Baird is superintendent.—The Hercules mine, above Galena, intends shipping ore to the Branch Mint mill when it is completed.—The Rex G. M. Co. of Lead is being worked under the superintendence of J. Gilroy. This company has a gasoline mining plant, the hoist having a capacity of eight tons from a depth of 1200 feet.

## Pennington County.

The Golden West Mining Co. will resume operations on its property, near Rochford, early in April, and the mill be put in operation, the weather permitting. The mine has a shaft 80 feet deep and about 500 feet of tunnel. The flume furnishing power for the mill is 2 miles in length. The ore is free milling, and the mill of Chilean type is capable of treating 100 tons in twenty-four hours.

At the Gertie tin mine at Hill City, E. C. Johnson is erecting the 15-ton mill, with the help of local men taking stock in full for their labor, says the Mining Review. The stamp mill and engine are all set. The rest of the machinery is on the ground, including a Blake rock crusher, ore feeder, amalgamating plates to save the gold in the rock, and a concentrator to save the tin. The floors are all laid and two large ore bins are nearly completed.

S. Morrow of Silver City announces that work is to be resumed by the Jenny Gulch M. & M. Co. on its quartz veins, 1 mile southeast of Silver City.—The Calumet M. & M. Co. is prospecting and working the Kelly placer bar near Silver City. H. L. Osborn is general manager.—E. P. Tuttle of Silver City and G. P. Billups of Rochford are developing the Dictatum claims, 1 mile northwest of Silver City.—It is reported that the Montezuma mill, near Rochford, will be started soon. At the mine a double track tunnel is being driven to cut the vein at a depth of 500 feet.—The Golden West M. Co., working the Benedict and Yellow Bird in the Hornblende district, 5 miles west of Rochford, is ready to supply ore to the new mill. The mill is 2700 feet from the mine and connected by an aerial tram and is operated by water power from a 7000-foot flume giving a fall of 107 feet and generating 140 H. P. C. E. Curtiss has charge.—F. Herbert, manager of the Clara Belle mine, 8 miles north of Custer City between Oreville and Sylvan Lake, intends sending ore from the 260-foot level of the shaft to Denver to determine the best methods of handling it.

After years of litigation it is reported that the Standby mine, a mile below Rochford, is about to resume operations, the trouble having been settled. The property has a 60-stamp mill which, with a little repair, can be started up. The owners claim that they can mine and mill the ores for less than \$1 per ton. The company has a shaft, one tunnel over 400 feet, besides a large amount of other underground work.

The steam hoist at the Canton mine, near Hill City, has been put in place. The company has constructed a commodious new shaft building and is excavating the ground for a 20-ton test mill. The intentions of the company are to put in a large plant with the Chilean process, the same as the Lundberg, Dorr & Wilson plant, if everything is found to work satisfactorily. The main shaft is 100 feet deep, from which 300 feet of drift has been extended along the vein. A. Anderson is at the head of the work.

J. B. Taylor, of the Black Hills Copper Co. of Rochford, says that everything has been prepared for the resumption of operations at the company's mine, the new water system having been completed. The company's annual meeting occurs on April 11th in Deadwood, when affairs will be discussed and plans laid for the season's activity.—A shaft is being sunk on the Dakota-Calumet, near Sheridan, to open up the two copper veins by drifting from the bottom of the shaft.

## UTAH.

## Juab County.

The ore shipments from the mines of Tintic for March aggregated 662 carloads, of which the Centennial Eureka mine contributed 357 carloads. The bad wagon roads connecting some of the mines with the railroads have curtailed shipments somewhat during the past month and the output for the month of April should be larger. The output for the month of March in detail was as follows: Centennial Eureka, 357 tons; Bullion Beck, 37; Gemini, 60; Eagle and Blue Bell, 36; Uncle Sam, 15; Godiva, 2; Yankee Con., 21; Carisa, 11; Grand Central, 31; Mammoth, 44; May Day, 16; Star Con., 6; South Swansea (lease), 2; Joe Bowers, 1; Ajax, 6; Lower Mammoth, 1; Swansea (lease), 2; Victoria, 6; Monterey, 2; Victor, 5; Marlow & Baxter, 1. There were also four carloads of concentrates shipped from the Uncle Sam mill during March.

## Salt Lake County.

The Columbus Con. at Alta is working eighty men, in sinking the two shafts, and breaking ore above the tunnel level, and transporting it through the long tunnel to the mill. At present fifteen teams are hauling concentrates to the smelter, but this amount is inadequate. A. O. Jacobson is superintendent.—The South Columbus at Alta is driving ahead at the rate of 3 feet per day, with their power machinery.

Manager Crowther of the Continental-Alta reported on Wednesday night the presence in several stopes of from 4 to 6 feet of good copper ore, upon which he has begun stoping, as the new buckets have been added to the tramway. The main tunnel, which has been driven 3500 feet, is now connected with all portions of the mine after eighteen months of drilling.

The Bingham Bulletin reports that the Utah Copper Co. has decided to commence the construction of a milling plant of 6000 tons capacity upon its property near Pleasant Green, 12 miles north of Bingham. The present mill at Bingham is to be enlarged at once to a capacity of 1000 tons, making a total milling capacity of 7000 tons daily. A railroad 15 miles in length will connect the mine with the mill. An electric power plant will be put in at the mill of sufficient capacity to provide all the light and power needed by the mine and mills. The company at present is milling 700 tons of ore daily. Plans for the new mill will be prepared at once, and it is hoped that it may be completed within fifteen months. During the progress of mill construction the mine will be further developed to supply the tonnage needed. Both the caving and the open-cut systems will be adopted, the latter involving the system of quarrying with steam shovels from open cuts as the great iron deposits are handled. D. C. Jackling is general manager of the company.

It is announced that a 500-ton addition is to be made to the Highland Boy smelter of the Utah Con. M. Co., at Bingham. The "M" ore body, opened on the 8½ level, has now been crosscut from wall to wall and is shown to be 130 feet in thickness, with the ore of uniform and average grade. The mine is sending down 850 tons of ore daily.—Manager J. E. Edmunds of the Copper Glance reports that the breast of the deep tunnel, started last season in McGuire gulch, east of Bingham, and now driven between 600 and 700 feet, is impregnated with mineral throughout, and that small streaks of ore carrying as high as 8% copper have come in.—The Teck tunnel, at the Boston Con., has now been driven 25 feet into the copper-bearing porphyry and the rock is improving. The carbonates have been replaced by sulphides and the rock at the face will average 2%, with many streaks of higher grade, including seams of chalcocopyrite.—The Butler-Liberal, at Bingham, has started up its air compressor and work has been resumed with the machine drills.

The Kempton mill, at Bingham, owned by E. A. Wall, is being remodeled, enlarged and improved. New machinery is to be added and the capacity increased from 90 to 150 tons daily. The added machinery will include two corrugated Wall rolls, making four rolls in all. After passing through the first set, the ore will be screened and put through the second set, instead of going through the same rolls twice, as heretofore, thus effecting a saving in labor and expense. The four old jigs will be thrown out and replaced by five new ones of improved pattern, which will make an over-size product for recrushing. Two more Wilfley tables also will be installed, making four in all.

## Sevier County.

By the recent joining of No. 4 and No. 5 tunnels of the Annie Laurie mine, at Richfield, the ores from all the upper workings may be dumped into No. 5 tunnel and transported direct to the mill.—The Trappers' Pride, near Richfield, owned principally by P. W. Madsen of Salt Lake, has been worked all winter. The vein has been followed 600 feet.—W. Johnston, W. Blake and W. J. Skelton have resumed work at the Copper Butte, near Richfield.

## Summit County.

The main shaft on the properties of the New York Bonanza, at Park City, has reached the 800-foot level, and crosscutting has been started to tap the channel.

## Uintah County.

The gravel bars in the Green river, near Jensen, are being worked after having been prospected during the past winter.

## Utah County.

A 5-foot vein of crystallized lead ore is reported in the breast of the upper tunnel of the Buckley mine in Rock canyon near Provo. In the lower tunnel, which will tap the vein about 300 feet below the upper tunnel, a large quantity of lead ore is being encountered in pockets and stringers in the limestone, and this is taken as an indication that the vein will soon be reached. B. F. Woodward & Co., who have a lease on the mine, have five carloads of ore ready for shipment.—The Provo Pressed Brick Co. has bought placer claims in the Lehi mining district from J. McCloskie of Provo.

## WASHINGTON.

## Ferry County.

R. L. Boyle, manager of the Keller & Indiana Con. Smelting Co. at Keller, expects that by July 1 all the



machinery for a 100-ton copper matte furnace, a 50-ton lead reduction furnace, a sampling mill and electrical plant for lighting the reduction works, the mine and the town of Keller, will be delivered. Electricity will be used to run the power drills in the mine. The dam across the San Poll river is completed and the 1½-mile flume is half finished.

#### Okabogan County.

J. E. Goibnov, president of the Grand View M. Co., near Loomis, has been at the mine examining development work done. An electric power plant to run the treatment plant and operate drills is being put in at Cecil creek, 1 mile south of Loomis. This work is in charge of S. Tollman. On Palmor lake a 20-stamp mill is being put up under direction of E. P. Chilson. It will be equipped with cyanide tanks and operated by electricity. It is 2 miles from the mine and the ore will be carried down by a tram.—At the Copper World extension a shaft is down 100 feet and a crosscut to the north has cut considerable ore. The contract calls for 200 feet more shaft work and 300 feet of crosscutting by Manager Bahrs.

I. H. Robb of Newark, Ohio, has started work in the Gladstone mine, on Pilot mountain, near Chesaw. He will also work the Mary Ann creek placer mines, where a hydraulic plant is being put in.

#### Snohomish County.

F. Peabody of Monte Cristo is building a surface tram 3000 feet from the Sidney mine to the railroad and hopes to begin shipping within sixty days.—The Index M. Co., L. Willbur president and manager, with office in Snohomish, is planning to add an air compressor to extend its tunnel, which is in 1200 feet.—The Imperial M. Co. at Silverton will start work. E. M. Stephens is president.

#### Stevens County.

J. Selmer of the Prudential mine on O'Toole mountain, 11 miles south of Northport, says that the Prudential is a gold property, with an iron capping. The tunnel is in 300 feet.—At the Pittsburg group, owned by Grutt Bros. of Davenport and Mulligan Bros. of Bossburg, a black, coal-like mineral, found in considerable quantities, is reported to be pitch blende. There is 800 feet of tunnel.

The Copper King mine at Chewelah has ceased shipments on account of the condition of the roads between the mine and the railroad. The company is arranging to put a traction engine between the mine and Chewelah with a capacity of fifty tons per trip and two trips a day. It is 5 miles from the mine to the railroad station.

## FOREIGN.

### BRITISH COLUMBIA.

#### Boundary District.

It is said that operations are to be started at the Stem-winder mine, one of the Brooklyn group at Greenwood. Air for several drills will be taken from the Granby pipe line, while the hoist in the incline shaft will be operated by steam. Work has been resumed on the Golconda group, South Deadwood, W. Hanna and J. Johnson having contract to drive 200 feet of tunnel. In previous work the tunnel was driven 300 feet.

Shipments from Boundary mines for week ending April 1 exceed that of last week a little: Granby mines to Granby smelter, 13,140 tons; Mother Lode to British Columbia Copper Smelter, 4256; Brooklyn to Montreal & Boston Smelter, 2702; Rawhide to Montreal & Boston Smelter, 1551; Mountain Rose to Montreal & Boston Smelter, 198; Emma to Nelson Smelter, 132; Oro Denoro to Granby Smelter, 66; Elkborn to Trail Smelter, 20; Last Chance to Montreal & Boston Smelter, 27; Skylark to Granby Smelter, 20; E. P. U. to Trail Smelter, 20; total for week, 22,132 tons; total for year to date, 238,240 tons. Smelters treated as follows this week: Granby, 12,476 tons; British Columbia Copper, 2738; Montreal & Boston, 4423; total for week, 19,637 tons; total for year, 236,239 tons.

The Montreal & Boston Copper Co., which recently acquired the Seattle mine, near Grand Forks, is working night and day forces to put this property on a shipping basis.—Peter Pare of Grand Forks has commenced work on his 125-foot tunnel on the Sunset fraction on Hardy mountain.—W. E. Zwicky, manager of the Rambler-Cariboo mine, near Sandon, says the company is continuing the development work it took up eight months ago to drive a tunnel 4400 feet to strike the 1450-foot level. It is in 2000 feet now.

#### Nelson District.

Manager A. H. Kelly of the Reliance G. M. Co., owning the May and June, the Reliance and four other claims carrying gold quartz, near Nelson, expects that his 50-ton cyanide mill will be ready to run in May. Agitation is by the Hendryx process.

The Second Relief mine, at Ymir, is reported to have started operations. G. H. Barnhardt is in charge.

#### Southeast Kootenay District.

J. Cronin, manager of the St. Eugene mine at Moyie, has ordered an air compressor having a capacity of 3000 cubic feet of air a minute and will furnish power for thirty machine drills. Boilers will also be put in that will have a capacity of 500 H. P. This will give the mine a 50-drill equipment, there now being twenty machine drills in use.

#### Vancouver Island.

It is reported that Chas. Ramsey and Dr. Roughshead will build dredges at Golden City, on the Saskatchewan river, 3 miles east of Prince Albert. Each is to have a capacity of 5000 cubic yards daily and will be operated by electricity.

## MEXICO.

#### Chihuahua.

The Compania Minera Ignacio Rodriguez Ramos, S. A., has 300 men working their lead and copper mines at Baca, under the superintendence of R. G. Aguirre. R. A. Luistro is manager.

#### Sinaloa.

The American-Mexico M. & D. Co., W. S. Dillon manager, at San Lorenzo is said to be employing 900 men at its mine and smelter. D. T. Parker is superintendent of the smelter and furnaces.—J. B. Heymes has twenty

men working the Mina Restauracion de San Juan at San Lorenzo.—At Cosola the silver-lead property of the Compania Minera La Prieta y Annexas is in charge of J. B. Hernandez.

## Personal.

J. B. BROWN is manager Rainier G. M. Co. of Warren, Idaho.

H. LAHIFF has returned to Calaveras county, Cal., from Europe.

N. G. WOLFE is running the Independent assay office at Clifton, Ariz.

WM. BALL is superintendent Lower Mammoth mine at Eureka, Utah.

J. H. SINCLAIR of Denver, Colo., is at the Le Roy mine near Custer, S. D.

E. J. KENNEDY is general manager Golden West M. Co. near Rochford, S. D.

M. HARMAN of Mansfield, Ohio, is manager at the Ruby mine, near Loomis, Wash.

J. J. CASE has gone to Cerro de Pasco, Peru, as superintendent Haggin smelter.

A. M. BREWSTER is assistant superintendent Viebach M. Co. in Oaxaca, Mexico.

W. E. HINDRY is general manager Esperanza M. Co. at El Oro, Mexico, Mexico.

D. H. LAWRENCE is consulting engineer Germania G. M. Co. of Idaho Springs, Colo.

H. L. JONES, general manager Antler mine, near Hill City, S. D., is East on business.

ALGERNON DEL MAR has gone to Greenville, Plumas county, Cal., from Silver Peak, Nev.

GEO. PIERCE of Denver, Colo., is manager Original Bullfrog M. Co., at Bullfrog, Nevada.

A. M. ROCKWELL has resigned the superintendency of the White G. M. Co., Tucson, Ariz.

A. J. UNDERWOOD is manager Lluvia de Oro G. M. Co. at Batopilas, Chihuahua, Mexico.

C. J. ALLEN has returned to the Monumental mine, near Granite, Or., from Portland, Or.

O. RYDEN is superintendent American-Mexico M. & D. Co., at San Lorenzo, Sinaloa, Mexico.

J. J. DEMING succeeds W. D. Southworth as superintendent Gold Eagle mine near Neil, Idaho.

E. E. CONNERY, president Continental mine at Vulcan, Colo., has been in Minneapolis, Minn., on business.

J. J. BENNETT has been appointed mine foreman De Lamar's mines at De Lamar, Owyhee county, Idaho.

C. C. MATTHEWS, superintendent Oregon Securities mine at Bohemia, Or., has been in San Francisco, Cal.

W. B. ROBERTS has assumed the management of the Goldfield Herald and Goldfield-Gladiator mining companies.

FERD. MCCANN is manager Grados M. Co. and the Guerrero M. Co. at Los Grados, Tlaxcopec, Guerrero, Mexico.

L. R. MEAD succeeds the late Geo. H. Wallis in the vice-presidency of the Mechanics' Institute of San Francisco, Cal.

H. HUGHS is superintendent Tecolotes mine of the Guggenheim Exploration Co., at Santa Barbara, Chihuahua, Mexico.

L. S. CATES has been promoted from the position of superintendent to that of mine manager for the Boston Con. M. Co. at Bingham, Utah.

V. NUSBAUM, secretary and treasurer Cleveland M. & M. Co., operating the California mines at Silver City, Idaho, has been examining work done at the mine.

H. J. CUNNINGHAM, manager Endless Chain M. Co., operating claims in the Harshaw district, Arizona, has gone to San Antonio, Texas, where he will enter a sanitarium.

L. W. TRUMBULL, Professor of Mining and Geology, School of Mines, University of Wyoming, has been appointed consulting engineer to the Strong Copper M. Co. of Leslie and Laramie, Wyo.

GEO. B. DAMON, who has been manager of the Wellman-Seaver-Morgan Co.'s New York office, goes to their main office at Cleveland, Ohio.

H. V. CROLL, recently Pacific coast district manager Allis-Chalmers Co., San Francisco, Cal., is now at 244 Equitable Bldg., Denver, Colo.

F. E. WADE of Lead City, S. D., general manager Globe M. Co., is in the East placing orders for the machinery for the company's mill.

G. H. SAVAGE, general manager Milwaukee Gold Extraction Co., on Flint creek, between Philipsburg and Anaconda, Montana, has been in Milwaukee, Wis., attending a meeting of the stockholders.

A. C. BUNKER AND W. C. APPLETON, alternating current engineers, have become associated with the Crocker-Wheeler Co., Ampere, N. J., in the engineering and contract departments, respectively.

W. A. STADELMAN, former manager Eastern office Brown Hoisting Machinery Co., is now manager of the general Eastern office of the Wellman-Seaver-Morgan Co., with offices at 42 Broadway, New York City.

SAML. JAMES is manager Amoloya smelter at Toluca, State of Mexico, Mexico, having resigned as superinten-

dent Ohio & Colorado Smelter at Salida, Colo. G. C. Griswold, formerly superintendent Globe smelter at Denver, succeeds him.

DR. DAVID T. DAY, Chief of the Mining and Mineral Statistics of the United States Geological Survey, and also chief of the mining exhibit at the Portland, Or., exhibition, has left San Francisco, Cal., for the East via Denver, Colo.

WM. A. POMEROY has returned from Western Australia to Palo Alto, Cal. He was manager of the Great Fingall Con.-Day Dawn, West Australia, and was sent for by Bewick, Moreing & Co. to Kalgoorlie to succeed Ralph Nichols as manager Great Boulder Perseverance mine.

E. W. PARKER, in charge of the Government coal testing plant at St. Louis, Mo., is in California investigating the coals of the Pacific coast, and making arrangements for the shipment of coal from the several coal producing regions of the coast to St. Louis for briquetting tests.

C. E. GRUNSKY, who resigned as city engineer, San Francisco, Cal., to be one of the Panama Canal Commissioners, has resigned therefrom and been appointed consulting engineer in the reclamation service connected with Federal irrigation, at an annual salary of \$10,000. Mr. Grunsky will reside in Washington, D. C.

W. A. PRITCHARD, formerly superintendent Keystone mine at Amador City, Cal., but who for three years past has been a manager of the Bewick-Moreing interests in West Australia, it is reported has resigned and is on his way to the United States, via London. The reasons for Mr. Pritchard's resignation are not stated.

## Commercial Paragraphs.

H. S. MANNING has sold his interests in the firm of Manning, Maxwell & Moore, Liberty street, New York, to his former partner, Chas. A. Moore.

A PYRITIC SMELTING FURNACE built by the Vencadora Mine Equipment Co. is in successful operation at the Fulton Iron Works, San Francisco, Cal.

THE C. O. Bartlett & Snow Co., of Cleveland, O., report about thirty recent sales, among them to the Western Ore Separating Co., Salt Lake City, Utah, a direct heat rotary ore dryer and a similar one to the Henrietta Cyanide & Dev. Co., Henrietta, Ariz.

THE Allis-Chalmers Co. is removing its general offices from Chicago, Ill., to Milwaukee, Wis. The company has four other works in three other cities, but the largest works are in Milwaukee, and there is where all any future expansion of the company's operations will take place.

AT Dolgeville, Cal., Alfred Dolge, during the past year, has made 100,000 pairs of felt shoes. There is no charge for beating, for the California sun furnishes warmth gratis. He figures that he saves \$20,000 a year on his factory costs over the costs in his former Dolgeville, N. Y., shop. The Dolgeville, Cal., shops are driven by electric power, at an approximate cost of \$25 per horse power per year.

ARRANGEMENTS have been completed between the Lazier Engine Co. of Buffalo, N. Y., and the Dubois Iron Works, also of that city, for the manufacture of the Lazier gas and gasoline engines. Arthur A. Lazier, former vice-president of the Lazier Gas Engine Co. and patentee of the engines, has secured the entire control, which will be known hereafter as the Lazier Engine Co., head offices in the Ellicott Square, Buffalo, N. Y.

THE Rapid-Economy Stamp Mill Co. of San Francisco, Cal., report installing an additional 3-stamp battery of Richards' rapid-economy stamp mill on the Gold and Silver mine near Kelsey, El Dorado county, Cal., and state that the owners of the property have satisfactory results from the operation of the mill already installed by them. In this mill the levers, which are used instead of cams, drop the stamps at a speed of about 200 per minute.

THE Ingersoll-Sergeant Drill Co. of New York write: "The last official act of the Panama canal commission before resigning was to close a contract with the Ingersoll-Sergeant Drill Co. of New York for fifty standard rock drills of that company's manufacture, complete with mountings and equipment, to be used in the removal of rock in the great Culebra cut through the crest of the isthmus. The commission furthermore authorized the same company to remodel a large number of the French-Ingersoll drills, built in France under the patents of the American manufacturers. These machines remain from the original equipment of the old French company formerly operating on the canal."

THE shop employees of the Crocker-Wheeler Co. at Ampere, N. J., have organized a beneficial association. Every employe who pays 10 cents a week to the association will be entitled to \$10 a week, for twenty weeks, during incapacity through illness. If he dies his family will receive \$100. The payment of 20, 30 or 40 cents a week entitles him to \$15, \$20 or \$25 respectively, with death benefits of \$150, \$200 or \$250. The company has offered to contribute an amount equal to the dues paid to the association. Thus, if \$6000 are paid yearly in dues, the income of the association will be \$12,000. The company does not require representation in the association, which will be run entirely by the employees.

THE Animas Water & Power Co., of Durango, Colo., is installing a large hydro-electric plant. The power house is 20 miles from Durango. There is an effective head of 970 feet available through 2800 feet of pipe. The initial installation is two 2250 K. W. Gen. Elec. generators, direct-connected to Pelton water wheels; provision has been made in the dam and head works for an ultimate development of 30,000 H. P. The present pipe line, one for the two units, is of sheet steel, varying in diameter from 44 inches at the upper end to 34 inches at



the wheels, and of thicknesses from  $\frac{3}{4}$  inch to  $1\frac{1}{4}$  inch. The pipe is all double buttstrap riveted, with triple riveting at the lower end, and is provided with flanged connections. The water wheel units, two in number, are of the "double-overhung" construction; each unit consisting of two Pelton wheels, one overhanging each end of the main shaft, with the engine-type generator in the center. Needle nozzles are used, operated by oil pressure, and with automatic governors. The wheels are approximately 8 feet in diameter, with centers of cast steel, turned all over and fitted with Pelton buckets straddling the periphery and secured to same by turned steel bolts driven in reamed holes. The buckets are fine ground and machined inside to obtain high efficiency.

## Books Received.

The April issue of Air Power, published by the Rand Drill Co., contains description of the Carnegie gas plant, describing the methods of installing the compressor, laying the gas pipe line, giving capacities and general data of interest to engineers engaged in this class of work. Economy in the operation of coal mine power plants by F. C. Weber, M. E., is a discussion on operating costs of interest to coal producers and operators. The method of boring the Laurel line tunnel in Pennsylvania is outlined. This number of Air Power also deals with a 300-foot air lift, the installation of which was attended with some unusual conditions. The paper will be sent by the Rand Drill Co., 128 Broadway, New York, N. Y., on request.

"Bimonthly Bulletin of the American Institute of Mining Engineers" contains regular announcements and technical papers. T. E. Schwartz contributes a discussion on the occurrence of ore in the Yankee Girl mine at Red Mountain, Ouray county, Colo., in which he concludes that the ores of the district occur in persistent chimneys to which Ransome's term "stocks" does not well apply. In the upper zones fracture planes were not much in evidence. The siliceous envelope of the chimneys, a marked feature in the upper levels, gradually disappears with depth. W. Lindgren describes the occurrence of stibnite at Steamboat Springs, Nev., H. O. Hofman and W. G. Magnus on detail experiments on the effect of silver on the chlorination and bromination of gold using different strengths of solution and varying proportions of gold, and silver. The data show that a supersaturated solution of chlorine in water acts more strongly than one that is merely saturated, that a supersaturated solution can extract a satisfactory percentage of gold from a gold-silver alloy containing as much as 20% of silver and that with the decrease of chlorine below 2.1 grams in 150 c.c. of water and the increase of silver above 10%, the extraction of gold falls off quickly. "The results of bromination show that bromine is an efficient solvent for gold, giving extractions of 99.8%, 98.2%, 96.6%, 93.2% and 92.2% with solutions of 8.97, 5.98, 4.48, 2.90 and 2.60 g. of bromine in 150 c.c. of water; when the bromine present sinks to 2.1 g. the yield in gold falls quickly to 34.2%, and then diminishes more rapidly. With concentrated solutions (2.8 g. Cl, equivalent to 6.0 g. of Br) chlorine is a slightly stronger solvent than bromine; as the solutions become less concentrated the dissolving power of Cl falls more quickly than that of Br," the latter being the more efficient solvent in dilute solutions. Other papers are "Open Hearth Manipulation" by A. McWilliam and W. H. Hatfield, "Comparison of Methods for Determination of Carbon and Phosphorus in Steel," "The Development and Use of High-Speed Tool Steel," by J. M. Gladhill, "A Special Form of Slag Car," by L. J. W. Jones and B. H. Bennetts, "The Case of Henry Cort," by Chas. H. Morgan, "Blast-Furnace Plant of the Elba Società Anonima di Miniera di Alti Forni at Portoferraio, Elba," and "Labor-Saving Devices in the Works Laboratory," by Ed. Keller.

## Obituary.

ROGER SHACKLETON, a pioneer mining man of Nevada county, Cal., died March 30 at Grass Valley, Cal., aged 76 years.

HENRY VIGARS died of miner's consumption at Telluride, Colo., March 28. Deceased was a native of Devonshire, England, and in his 45th year.

A. C. LAMB, superintendent Tres Amigos mine, near Tucson, A. T., was blown to pieces by an infernal machine while asleep on April 5. Several sticks of dynamite were placed under a corner of the house and a 5-foot fuse attached.

JAS. F. WARDNER died at El Paso, Texas, on March 30th, aged 59. "Jim" Wardner was a type of the modern Bedouin whose wanderings are only limited to his ability to "get there." He was a miner who delighted in taking big chances, and, if he lost, consoled himself by the knowledge that he could strike it rich somewhere else and that success was only deferred. Like others of his class he made and lost several fortunes and was buoyant and hopeful to the day of his death. He was known everywhere that mining is done, and whether in the Cœur d'Alenes, the Klondike, Panama or South Africa, he had countless acquaintances in a career that throughout was more interesting than prosperous, if the acquisition and retention of ready money he accounted prosperity.

## Dividends.

The Bunker Hill & Sullivan M. & C. Co., Idaho, \$75,000, payable 4th inst.; total paid since Jan. 1, 1905, \$375,000; total to date, \$2,646,000.

## Trade Treatises.

Double-Friction Coil Clutch Co.'s booklet describes their make of clutch with sectional drawings and full description. It will be sent on application to the company, 42 River street, Chicago, Ill.

Crane Co.'s advance circular describes Crane steam and oil separators; twenty-six 10 $\frac{1}{2}$ x13 $\frac{1}{2}$  sheets, printed on white enameled paper, handsomely illustrated. It will be sent to the trade upon request; ask for "Advance Circular No. 01," writing Chicago or San Francisco.

## Latest Market Reports.

SAN FRANCISCO, April 7, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 25 $\frac{1}{2}$ d (standard ounce, 925 fine); New York, bar silver, 55 $\frac{1}{2}$ c, refined (1000 fine); San Francisco, 55 $\frac{1}{2}$ c; Mexican dollars, 46c, San Francisco; 43c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.37 $\frac{1}{2}$  to \$15.50; Electrolytic, 1 to 3 casks, \$15.37 $\frac{1}{2}$ ; Casting, 1 to 3 casks, \$14.87 $\frac{1}{2}$ . San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18 $\frac{1}{2}$  to 24c. London: £67 5s spot per ton.

Copper is again slightly higher, having both fallen and risen again within the week. There are those who believe that a higher price will soon be reached. The demand for the metal continues strong and the price is well maintained; still the market appears devoid of speculative features, probably because those inclined to speculate do not really believe that the metal will go much higher, and there is no reason to anticipate a much lower price under existing conditions.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12 $\frac{1}{2}$ ; San Francisco, \$3.70, carload lots; 4 $\frac{1}{2}$ c 1000 to 4000 lbs.; pipe 6 $\frac{1}{2}$ c, sheet 7, bar 5 $\frac{1}{2}$ c; pig, \$4.85. London: £12 11s 6d  $\frac{1}{2}$  long ton.

SPELTER.—New York, \$6.00; St. Louis, \$6.15; London, £23 7s 6d  $\frac{1}{2}$  ton; San Francisco, ton lots, 6 $\frac{1}{2}$ c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.20 to \$30.37 $\frac{1}{2}$ ; San Francisco, ton lots, 31c; 500 lbs., 31 $\frac{1}{2}$ c; 200 lbs., 32c; less, 33c; bar tin,  $\frac{1}{2}$  lb., 35 $\frac{1}{2}$ c. London, £139 10s 0d.

PLATINUM.—San Francisco, crude, \$18.50  $\frac{1}{2}$  oz.; New York, ingot, \$19.50  $\frac{1}{2}$  Troy oz. Platinum ware, 75 $\frac{1}{2}$  to 82c  $\frac{1}{2}$  gram.

QUICKSILVER.—New York, \$40.00 to \$41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00  $\frac{1}{2}$  flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6 $\frac{1}{2}$ c; extra, 17 $\frac{1}{2}$ c; genuine, 31 $\frac{1}{2}$ c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.75c.

ZINC.—Metallic, chemically pure,  $\frac{1}{2}$  lb., 50c; dust,  $\frac{1}{2}$  lb., 10c; sulphate,  $\frac{1}{2}$  lb., .04c.

NICKEL.—New York, 55 $\frac{1}{2}$  to 60c  $\frac{1}{2}$  lb.; ton lots, 40 $\frac{1}{2}$  to 47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31 $\frac{1}{2}$  to 34c.

ALUMINUM.—No. 1, 99%, small lots, 37c  $\frac{1}{2}$  lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35 to \$16.85; gray forge, \$16.65; San Francisco, bar, 3c  $\frac{1}{2}$  lb., 3 $\frac{1}{2}$ c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00 to \$27.00; open hearth billets, \$23.00 to \$27.00; San Francisco, bar, 7c to 12c  $\frac{1}{2}$  lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6 $\frac{1}{2}$ c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails,  $\frac{1}{2}$  c  $\frac{1}{2}$  lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case,  $\frac{1}{2}$  c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6 $\frac{1}{2}$ c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00 to 5.00; extra sizes higher; redwood, \$28.00 to \$30.00; lath, 4 eet, \$4.50 to 5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00 to \$35.00.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city  $\frac{1}{2}$  hbl.

CEMENT.—Imported, \$2.15 to \$2.65  $\frac{1}{2}$  bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20  $\frac{1}{2}$  bbl. in sacks, 4 sacks to hbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7 $\frac{1}{2}$ c; Hallett's, 7 $\frac{1}{2}$ c; San Francisco, 1000-lb. lots, 9c; 300 to 500-lb. 9 $\frac{1}{2}$ c; 100-lb. lots, 10 $\frac{1}{2}$ c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15 $\frac{1}{2}$ c; less than one ton, 17 $\frac{1}{2}$ c. No. 1\*, 60%, carload lots, 13 $\frac{1}{2}$ c; less than one ton, 15 $\frac{1}{2}$ c. No. 1\*\*, 50%, carload lots, 11 $\frac{1}{2}$ c; less than one ton, 13 $\frac{1}{2}$ c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2\*, 35%, carload lots, 9 $\frac{1}{2}$ c; less than one ton, 11 $\frac{1}{2}$ c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50 to \$6 per 1000; 4x, \$6.50 to \$7; 5x, \$8 to \$8.50; Lion, \$9 to \$9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c  $\frac{1}{2}$  set; 14 oz., 40s., 9 $\frac{1}{2}$ c.

CHEMICALS.—Cyanide of potassium, 98%–99%, jobbing, 23 to 24c  $\frac{1}{2}$  lb.; carloads, 23 to 24 $\frac{1}{2}$ c; in tins, 30c; soda ash, \$2.00  $\frac{1}{2}$  100 lbs.; hyposulphite of soda, 3 to 3 $\frac{1}{2}$ c  $\frac{1}{2}$  lb.; caustic soda, in drums, 3 to 3 $\frac{1}{2}$ c  $\frac{1}{2}$  lb.; Cal. s. soda, hbbs., \$1.10 to \$1.20  $\frac{1}{2}$  100 lbs.; sks., 90c to \$1.00; chlorate of potash, 12 to 13c; nitrate of potash, 6 $\frac{1}{2}$  to 7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2 $\frac{1}{2}$  to 2 $\frac{3}{4}$ c; powdered sulphur, 2 $\frac{1}{2}$  to 2 $\frac{3}{4}$ c; flour sulphur, French, 2 $\frac{1}{2}$  to 2 $\frac{3}{4}$ c; alum, \$2.00 to \$2.25; California refined, 1 $\frac{1}{2}$  to 2c; sulphide of iron, 8c  $\frac{1}{2}$  lb.; copper sulphate, 5 $\frac{1}{2}$  to 5 $\frac{3}{4}$ c; chloride of lime, spot, \$2.50 to \$2.75; sulphuric acid, in carboys, 66 $\frac{1}{2}$  B, 1 $\frac{1}{2}$  to 2c  $\frac{1}{2}$  lb.; nitric acid, carboys, 8c  $\frac{1}{2}$  lb.

OILS.—Lard, boiled, hbl., 60c; cs., 65c; raw, hbl., 55c; cs., 63c; Lucol oil, boiled, hbl., 51c; cs., 56c; raw, hbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As, tral, 19c; Star, 19c; Extra Star, 22c; Ecocene, 21c, Elaine, 25c; Water White, in bulk, 12 $\frac{1}{2}$ c; Mineral Seal iron bbls., 18c; wooden bbls., 20 $\frac{1}{2}$ c; cs., 24c; Minera; Sperm, cs., 26 $\frac{1}{2}$ c; Deodorized Stove Gasoline, bulk, 16c, do., cs., 22 $\frac{1}{2}$ c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19 $\frac{1}{2}$ c; Lard Oil, E. W. S., hbl., 75c; cs., 80c; Neats-foot Oil, pure, hbl., 63c; cs., 78c; Sperm, crude, 63 to 68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52 to 57c.

BORAX.—Concentrated, 6 to 7c  $\frac{1}{2}$  lb.; powdered, 8 to 10c; fused, 20 to 25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5 to 6c  $\frac{1}{2}$  lb.; No. 1, 4 to 5c.

LITHARGE.—Pure, in 25-lb. bags, 8 to 9c  $\frac{1}{2}$  lb.

MOLYBDENUM.—Best, \$2.75  $\frac{1}{2}$  lb.

CHROMIUM.—90% and over,  $\frac{1}{2}$  lb., 80c.

PHOSPHORUS.—American,  $\frac{1}{2}$  lb., 70c.

SODIUM.—Metal,  $\frac{1}{2}$  lb., 50c.

BISMUTH.—Subnitrate,  $\frac{1}{2}$  lb., \$2.10.

URANIUM.—Oxide,  $\frac{1}{2}$  lb., \$3.50.

MERCURY.—Bichloride,  $\frac{1}{2}$  lb., 77c.

TUNGSTEN.—Best,  $\frac{1}{2}$  lb., \$1.25.

SILVER.—Chloride,  $\frac{1}{2}$  oz., 90c to \$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase,  $\frac{1}{2}$  lb., 7c; less than 500 lbs., 7 $\frac{1}{2}$ c.

MANGANESE.—Black oxide,  $\frac{1}{2}$  lb., 2 $\frac{1}{2}$  to 4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads  $\frac{1}{2}$  1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skew hack, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic,  $\frac{1}{2}$  ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MARCH 28, 1905.

786,088.—ORE PULVERIZER—E. H. Benjamin, Oakland, Cal.  
786,081.—FRUIT PRESS—H. Bollweber, Spokane, Wash.  
786,084.—SHEARS—A. E. Border, Los Angeles, Cal.  
786,774.—HEN'S NEST—C. H. Buckingham, Pico Heights, Cal.  
786,003.—BRICK CUTTING MACHINE—C. R. Coddington, San Rafael, Cal.  
786,021.—PAPER FOLDING MACHINE—R. B. Friend, Oakland, Cal.  
785,873.—CHAIN—R. G. Goldman, Los Angeles, Cal.  
785,879.—TIDE MOTOR—G. M. Helvin, Longbeach, Cal.  
785,950.—WHARF OR PIER—S. G. Hinds, S. F.  
786,239.—RAILWAY SIGNALS—J. D. Gordon, Riverside, Cal.  
786,216.—WIRE SPRINGER—W. H. Horner, Seattle, Wash.  
785,952.—BUTTER TRAY—A. C. Hummer, Seattle, Wash.  
786,141.—HONE—McGrall & Owens, Centralia, Wash.  
785,821.—PRINTING PRESS—E. N. Mills, S. F.  
785,825.—PRESSURE ROLLER—C. K. Orton, S. F.  
785,978.—BUTTER CUTTER—C. P. Ross, Seattle, Wash.  
786,084.—SCAFFOLD—C. J. Roy, Pasadena, Cal.  
785,771.—CHAIN DRIER—C. W. F. Steinmann, S. F.  
786,003.—SPEED INDICATOR—S. W. Walsh, S. F.  
785,985.—COUNTING APPARATUS—P. W. Walls, Covina, Cal.  
786,174.—CLAMP—F. O. Wood, Pasadena, Cal.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

WHARF OR PIER.—No. 785,950. March 28, 1905. S. G. Hinds, San Francisco, Cal. One-half assigned to Atlantic Gulf & Pacific Co. of same place, a corporation of West Virginia. The object of this invention is to provide such a construction for wharf, piers or other similarly supported floors or structures as to rigidly unite the floor portion with the vertical posts by which such portion is supported, by such union to strengthen the structure against the shocks of waves where thus exposed or to strengthen it against loads which may be carried thereon. It consists in the combination with the piles by which such structure is supported, of caps or heads, and means for connecting the horizontal and bracing beams of the wharf floor, and other details of construction.

BRICK OR TILE CUTTING MACHINE.—No. 786,003. March 28, 1905. C. R. Coddington, San Rafael, Cal. This invention comprises in a brick and tile cutting machine, a cutter comprising a rotary support and having radially-disposed pivoted frames, cutting means carried by the frames, said frames having a limited arc of movement about their pivots independent of the movement of their support and springs fixed to and removable with the frames as a unitary structure and coacting with the support and independent of the force of gravity to turn the frames about their pivots in the direction of rotation of the support. There are other details of construction which combine to form a new and useful device adapted to overcome difficulties hitherto experienced in this class of machine, and which improvements greatly increase the output of the machine.

PAPER FOLDING AND PACKAGING MACHINE.—No. 786,021. March 28, 1905. R. B. Friend, Oakland, Cal. Assigned to Interfold Paper Co. The object of this invention is to provide an apparatus by which paper may be cut into regular sizes and afterward folded into packages, in which each sheet is folded in the middle and the sheets interlock with each other from opposite sides, so that when one sheet is withdrawn from the package it rises and presents the edge of the next sheet in readiness for withdrawal. Such packages are usually employed for toilet or cigarette paper, which is cut into even sizes and is afterward placed in holders, from which it may be withdrawn, as above described. It consists of combinations of mechanism by which a continuous web of paper is cut into lengths, said lengths folded intermediate of their ends, and the folded sheets interlocked and formed into packages.



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## Tucson, Arizona.

One of the largest and most attractive of the cities of Arizona is Tucson, in Pima county. Tucson is one of the oldest towns of the Southwest, a settlement having been made here by the early Spanish Jesuits, who established missions and villages throughout Mexico and the southwestern United States at various dates from 140 to 300 years ago. Casa Grande, a ruin, near Florence, in the valley of the Gila river, is one of the marks of a semi-civilization which existed here long prior to the coming of the Spanish missionaries. For many years Tucson was a military post and a distributing point for a large surrounding region. The city has 10,000 inhabitants, being the most populous city in that Territory. The city



View of Tucson, Arizona.



Another View of Tucson, the Metropolis of Arizona.

occupies a valley, though surrounded by mountains of moderate height, in which are many mines, all tributary to the town. A great improvement is noticeable in the city within the past five years. In 1899 the town consisted chiefly of low adobe and brick structures, but the accompanying engravings show the character of buildings in the business portion of the city. Brick, stone and concrete structures have been built rapidly and the town is still growing. The grazing and agricultural interests are of importance as well as the mines, and Tucson has become the distributing point for a large portion of southern Arizona and northern Sonora, Mexico, the international boundary being but a few miles distant. Tucson is on the main line of the Southern Pacific.



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THE one important mining district of the United States where no large combinations of mines or mining capital has been undertaken is in the zinc-lead fields of Missouri and Arkansas. The mines there are for most part worked by small companies or individuals, often operated under the leasing system, and operations are in some instances of a somewhat primitive character, though not grossly extravagant. Still, in the main, this division of business, lack of uniformity in method and the expenses of management incident to this manner of carrying on mining operations makes the cost really higher than it would be under properly organized general direction of consolidated mines. Forty companies could be run under a single competent and experienced management and the economic results become more satisfactory than under the prevailing system. It is remarkable, with the opportunities which that field offers, that this consolidation of interest has not long since been effected. In this connection it is interesting to note that an electric power plant has been built in that district to supply light and power to the many mines, and that which heretofore has been one of the chief items of expense in the operation of mines and mills in the zinc fields will now be materially reduced.

AT the December, 1904, meeting of the California Miners' Association in San Francisco, Cal., several interesting papers were read, of practical value to mining men everywhere. The official report of the proceedings is just published, and in this issue some of the papers read are given the publicity attendant upon such appearance in this journal. Comment, rejoinder or additional remark is invited for similar publication, for in such interchange of opinion among practical men lies the largest possibilities for advance—for by discussion and comparison of methods the truth that "everybody is wiser than anybody" is most readily shown.

## Status of an Alien.

The question has again been raised as to what is the status of a title to a mining claim located by an alien who has not declared his intention to become a citizen of the United States, by the recent jumping of the Quartzite mine, near Goldfield, Nev. The proposition in general has several phases. The Federal statute distinctly says that mining lands are subject to location by "citizens of the United States and those who have declared their intention to become such." An alien may, however, purchase from a citizen locator, and hold the property until "office found." The Supreme Court of the United States has said: "By the common law an alien cannot acquire real property by operation of law, but may take it by act of the grantor and hold it until office found; that is, until the fact of alienage is authoritatively established by a public officer, upon an inquest held at the instance of the Government. The proceedings which contain the findings of the facts upon the inquest of the officer is technically designated in the books of law as 'office found.' It removes the fact upon which the law divests the estate and transfers it to the Government from the region of uncertainty and makes it a matter of record. It was devised, according to the old law writers, as an authentic means to give the King his right by solemn matter of record, without which he, in general, could neither take nor part with anything; for it was deemed a part of the liberties of England, and greatly for the safety of the subject, that the King may not enter upon nor seize any man's possession upon bare surmises without the intervention of a jury. By the civil law some proceeding equivalent in its substantive features was also essential to take the fact of alienage from being a matter of mere surmise and conjecture, and make it a matter of record. Such a proceeding was usually had before the local magistrate or council, and might be taken at the instance of the Government or upon the denouncement of a private citizen."

A citizen of the United States, or "one who has declared his intention to become such," acquires his title by complying with certain requirements of the law. The public lands are all the property of the Government, and the Government alone has the power to object to a location made by an alien, and to inquire into the qualifications of the locator. The Supreme Court has been called upon several times to pass upon the title of the alien locator and the conclusion is that a location made by an alien, who otherwise complies strictly with the requirements of the statute regarding the location of mining claims, acquires a title to such location, of which he can only be divested at the instigation of the Government by a legal process to which it is either directly or indirectly a party. When such title is acquired by a citizen, not even the Government can divest him of his rights so long as he complies with the requirements of the law. In cases of this nature, where the aliens have located mining claims, the Supreme Court has held that these locations were voidable (not void), and are free from attack by any one except the Government itself (*McKinley M. Co. v. Alaska United M. C.*, 183 U. S., 563, 572; 22 Sup. Ct. Rep., 84).

In view of these decisions of the Supreme Court of the United States, it is apparent that a citizen really has no legal right to enter upon and relocate a claim previously located by an alien. Notwithstanding this, the Supreme Court of Nevada has intimated that a mining claim located by an alien might be entered and relocated by a citizen (*Golden Fleece G. & S. M. Co. v. Cable Cons.*, 12 Nev., and *McEvoy v. Megginson*, 29 L. D., 164.)

Discussing the subject, "Lindley on Mines" draws the following conclusions:

"1. An alien may locate or purchase a mining claim, and until 'inquest of office,' may hold and dispose of the same in like manner as a citizen.

"2. Proceedings to obtain patent are in the nature of 'inquest of office,' and in such proceedings citizenship is a necessary and material fact to be alleged and proved.

"3. In all other classes of actions between individuals with which the government has no concern, citizenship is not a fact in issue, it need neither be alleged or proved.

"4. Naturalization of an alien at any time subse-

quent to either location or purchase is retroactive and enables him to proceed to patent; the antecedent bar to patent by reason of his alienage is removed.

"5. An alien may take title by descent to an unpatented mining claim in the absence of a State law inhibiting it. He may also hold such title until 'office found' and in conclusion says: "These conclusions are not altogether palatable, but we consider that they are forced upon us by the logic of the law.

ZINC is going up. The reasons for it are not apparent, for the production has been remarkably stimulated in the last two years by the successful introduction of several types of electro-magnetic separators, which afford a clean product of zinc blende from complex ores. With this great increase in production, the natural inference would be a falling market, while the reverse is the case. For many years the Joplin, Missouri, field has practically controlled the zinc market, but the now large and steadily increasing production of the Western mines has become an important factor. Last year the State of Colorado produced about \$4,000,000 worth of zinc, and other Western States and British Columbia a large amount. In the Joplin field, zinc is the principal mineral sought, and all the expense of mining is directly chargeable to that metal—lead being subsidiary, and precious metals being wholly absent. In the West, however, the zinc is in most cases a by-product, incidental to the mining for lead, copper, gold or silver, and the expense of production may therefore be considered as confined to the cost of concentration, transportation to the smelters and reduction charges. Formerly the zinc present in the ore was in many cases charged a penalty by lead smelters, and in consequence many mines carrying above 3% to 5% zinc were unable to ship that class of ore, and it went to the dump. Hundreds of thousands of tons of zinc bearing ore were thus accumulated and this is now being treated or will be treated in the future, while the present output of the mines producing this class of ore is treated as it comes daily from the mines.

THE coal mine disasters occurring lately in several Eastern States suggest that there must be something radically wrong in the conditions under which the mines are operated, which should receive the serious attention of the management. These accidents—so called—have nearly all been from explosions of fire damp, which is prima facie evidence that the ventilation of the mine workings is defective; that not enough pure air is driven into the mine to render the deadly damp harmless. It may be that the volume of air sent down into the workings is theoretically sufficient, but if so undoubtedly the distributing system is carelessly arranged, or lacks the necessary attention. Nearly all coal mines are supplied with elaborate ventilating plants for supplying fresh air to the workings, but unless the connections be properly made, some portions of the workings are likely to receive more fresh air than is really required, while other parts have too little. The fact that these deadly explosions occur in workings which have for months, possibly for years, been in daily use, indicates that a sufficiently close watch is not kept upon the daily, and sometimes hourly, changes in atmospheric conditions, which have a direct effect on the volume of gas present in the mine. The flow of gas is always accelerated when the atmospheric pressure falls, and what may be considered a fairly safe mine to-day, by reason of sudden atmospheric change, may become to-morrow a deadly trap, where a single mistake or bit of carelessness of one miner may result in an explosion which will wreck the mine and cause the loss of many lives.

SILVER has been given another jolt by the decree of the President of Mexico, who proposes to reform the monetary system of that republic. The Mexican mints cease free coinage of silver to-day. In view of this the silver producers of Mexico ask for relief from the present universal federal tax and the local municipal tax on their product. The depreciation occasioned by the operation of the new monetary system, which goes into operation May 1, justifies such request for further governmental action.



## CONCENTRATES.

COMPRESSED air is cheaper than steam for running machine drills under almost any circumstances.

TECHNICAL KNOWLEDGE, actual working experience and business ability are most necessary to success in the operation of a metallurgical plant.

ALL stock of corporations organized under the laws of California is assessable, regardless of what may be stated to the contrary by the prospectuses.

A ROCK TANK which leaks in a mine may usually be rendered tight by puddling clay in the tank, the fine silt closing the fissures or cracks through which the water escapes.

ONE of the largest electric generating stations in Germany is run by gas engines which derive the necessary supply of gas from the iron blast furnaces in their vicinity.

A 2-INCH machine drill in medium hard ground is often a very desirable machine to use in stoping small veins and in raises, owing to the facility with which they may be handled.

SOME of the most extensive coal beds of the West are found in Utah. The coal extends from the eastern boundary of the State, near Grand Junction, southwesterly into Arizona, nearly 200 miles.

OWING to the tendency of partly crossed belts to run off the pulley, when this arrangement becomes necessary to avoid such accident, the distance between the centers of the pulleys should be not less than twice the diameter of the largest pulley.

IF an air compressor is overloaded with drills, the air pressure at each drill will be lowered proportionally, and then the compressor must be speeded up to maintain the desired pressure, but under such strained conditions the economical limitations are soon reached.

THE several mesh standard mill screens are made of different sized wires. Thus a 35-mesh (1225 meshes per square inch) is made from No. 30 wire, and a 30-mesh (900 meshes per square inch) is made from No. 28 wire. A 20-mesh (400 meshes per square inch) is made from No. 23 wire, etc.

THE only material difference between massive and stratified tuff is that the former is deposited on the earth's surface and the latter either falls into water or is carried by streams into water, where a certain sorting action takes place, resulting in the stratification of the volcanic debris.

ALUMINUM is the lightest known metal, a cubic foot weighing 165 pounds, about the same as quartz. A cubic foot of mercury weighs 847 pounds and will float upon its surface all lighter metals, including copper, iron and lead. Gold and platinum sink in a mercury bath. A cubic foot of lead weighs 712 pounds.

NO CEMENT has been found which gives absolute security against decomposition by salt water, especially water containing sulphate, as sulphuric acid is the principal decomposing agent. Best results are obtained from Portland cement, low in alumina, free lime and gypsum, and by using coarse-grained, sharp sand.

IT is said that Commodore Peary, the Arctic explorer, who expects to make another effort the coming summer to reach the north pole, will carry the necessary apparatus to establish wireless telegraph stations along the route after leaving the ship. There appears to be little to prevent the carrying out of such a project.

THE effect of antimony sulphide in cyanide of potassium solutions is said to be the combination of a portion of the sulphur present in the antimony sulphide with potassium forming potassium sulphide, which is a very objectionable compound in cyanide treatment. The remainder of the sulphur combines to form sulphocyanogen.

SOME of the shafts in Lake Superior copper region have three compartments, where the end sections are used for hoisting, and the central compartment for manway, pipes, etc. The principal reason for this is to equalize the "travel" of the hoisting rope on the reel, or to make room for the hoisting engines and reels, if flat ropes are used.

THE amount of free air a rock drill requires per minute depends upon the size of the piston, length of stroke and air pressure at the drill. More air is consumed under high pressure (100 pounds) than under low pressure, but the drills run more rapidly and strike harder blows, and while this increases wear and tear in a somewhat higher ratio than where the drill

is run under relatively low air pressure, 60 to 70 pounds, the amount of work accomplished under high pressure more than compensates for the additional cost of repairs and of compression of the air.

THE wages paid a watchman on an idle mine cannot be charged to annual labor expenditure, unless it can be clearly shown that it is intended to resume operations within a short time. The watchman, moreover, should be employed in some active and useful work, such as rotimbering, or repairing buildings, etc., but this can only be done to a limited extent and in rare cases.

THE less the amount of dead work necessary in the operation of a mine the greater the likelihood of low cost per ton. The great masses of iron ore in the Lake Superior and Minnesota region require comparatively little dead work, though there are important exceptions. In some gold mines where the vein is small the greatest part of the expense is in the dead work required to search for new ore shoots and to keep the mine on a producing basis.

ALL concrete retaining walls, back of which water is likely to accumulate, should be provided with means for drainage. This is done by laying vitrified drain pipe underneath the base of the wall, so that the water accumulating there may be conducted away. A well built, 6-inch, concrete wall, made in the proportion of 1 of cement, 3 of sand and 6 of broken rock, will afford as much support to the earth as a 12-inch wall of brick. A wall of this character will support the pressure of 6 feet of earth. The wall should be built up inside of moulds, and allowed to set at least a week before the earth is filled in behind it.

THE present record of long-distance electric transmission is 345 miles at 60,000 volts, electric power having been transmitted from the De Sabla power house of the California Gas & Electric Corporation on Butte creek, Butte county, Cal., to Calaveras county, by Colgate, Oakland and Stockton. The power house contains three two-bearing type, hydro-electric generating units—two of 2000 K. W. and one of 5000 K. W. normal capacity. Water is conveyed from the reservoir, 1560 feet above the power house, by two 30-inch steel pipe lines 6000 feet long, delivering at a nozzle pressure of 675 pounds per square inch.

SPRINGS are usually the result of hydrostatic pressure, or gravity—practically the same thing. If water accumulates in a basin surrounded by a rim of solid rock formation, the water will saturate the gravels and loams of the basin, rise to the level of the encircling rocks, flow over at the low points in the rim, and usually flow out on surface at some lower point, as springs. Water confined in solid rock strata will flow out, forming springs, wherever the stratum holding the water reaches the surface at a point lower than the level of saturation. The appearance of springs is often miles away from the original source of the water.

IN the case where the vein is in the bed of the creek and running with it, the shaft should be sunk on the bank of the creek on the hanging wall side of the vein. Under such circumstances it is wise to sink a vertical shaft to cut the vein in depth, but such shaft should be located sufficiently far from the creek bed to reduce, as far as possible, the danger of the creek running through open fissures into the mine workings. Such a shaft should not cut the vein nearer than 150 feet from the surface, and a greater depth is advisable. Shafts have been sunk in the beds of creeks, the collar being surrounded by concrete, but this should only be done where no other course is open.

OFTEN a quick determination of the possible extraction of gold from an ore by the cyanide method is demanded of the assayer and cyanide operator. This cannot be satisfactorily given, as many ores require two to four days for the best economic extraction, and it is not to be expected that a higher extraction will be obtained by the use of ordinary solutions in the laboratory than in practice in the tanks. If a 60% extraction is obtained in twenty-four hours, it may be possible to greatly improve on this in the next twelve to twenty-four hours, with a still higher extraction on the third day. If accelerating materials are added to the solution, such as barium peroxide, a more rapid dissolution of gold may result, but the question as to the efficiency of this extraordinary method in practice must also be given consideration.

THE annual assessment work on mines in Arizona is governed by the United States laws. The location is made by erecting at or contiguous to the point of discovery a monument of stones not less than 3 feet in height, or an upright post projecting 4 feet above the surface of the ground, in which monument of stones or on which post shall be posted the notice of location, which shall be signed by the name or names of the locators. The notice must contain (1) the name of the claim located; (2) the name or names of the locators; (3) the date of location; (4) the length and width of the claim in feet, and the distance from the point of discovery to each end of the claim; (5) the general course of the claim; (6) the locality of the claim with reference to some natural object or permanent monument whereby the

claim may be identified. The law provides that until each of these things shall have been done no right to the claim shall have been acquired. From the time of locating the claim the locator shall be allowed ninety days within which to do, or cause to be done, the following things: (1) To cause to be recorded in the office of the county recorder in which the claim is situated a copy of the location notice; (2) to sink a discovery shaft 10 feet deep, and deeper if necessary to disclose mineral in place; (3) to monument the claim on the ground so that its boundaries may be readily traced.

UP to the latter part of 1904, the deepest vertical shaft in the world was the Tamarack No. 5, near Houghton, Michigan, the next deepest being the Red Jacket shaft of the Calumet & Hecla Company, also near Houghton. On Jan. 1, 1905, the No. 3 shaft of the Tamarack Company had reached a total vertical depth of 5066 feet. The No. 4 Calumet shaft is an incline 8100 feet deep, and is the deepest inclined shaft in the world. A winze below the lowest level of this shaft has been sunk 190 feet deeper, making a total depth on the conglomerate lode of 8290 feet. Calumet No. 2 is down 7000 feet on the incline. There are several inclined shafts on the Calumet & Hecla property exceeding 6000 feet in depth, and on the Tamarack there are two shafts 4450 and 4967 feet deep, respectively, beside No. 3, which is deepest.

THE linings for copper converters are made of quartz and plastic clay, the latter acting as a binder, to retain the lining in position, that it may withstand the effect of the blast and the violent surging of the molten matte when the air is turned in. The quartz for this purpose is generally crushed in a rock breaker, and the material passed through a trommel, which screens out all pieces  $\frac{1}{2}$  inch and under. The oversize is recrushed, and the coarse and fine mixed together with the clay. The lining does not stand well if all the rock be coarse, nor if all be fine. Experience has shown that the less clay that can be used in the hinder the better. The clay must be of good quality and plastic, although not necessarily fire clay. It is rammed by experienced men with heated iron bars. After ramming the lining should be slowly dried; if used while a large percentage of moisture is still present, it will soon require relining.

IN locating mining claims the prospector frequently "steps off" the several distances between corners and stakes. Unless the ground be comparatively level and free from obstructions, this is likely to lead to considerable errors in distance, particularly on the 1500-foot side lines. Many men consider a stride as 3 feet, when, in fact, few men stride this distance unless on a smooth road, and doing so intentionally. Ordinarily from 28 to 30 inches is the length of stride of the average man. It is better to measure the distance with a tape measure, stretching it tightly, for many woven tapes shrink about 1 to 2 inches in 50 feet. A steel tape is best, but if neither of these are available, a strong cord or light rope, the length of which is known, may be employed, but a length greater than 25 feet should not be used, as it is likely to stretch and make a greater error than in stepping off the distance. When pacing off any distance it is best to count every other step, say those with the right foot, putting the left forward first. In an ordinary stride 20 double paces equals 100 feet where each stride is 30 inches, and 300 such double strides will measure approximately the length of one side of a full mining claim—1500 feet. If it is intended to pace off ground in this manner, the best way is to measure off a given distance, say 200 feet, and then walk from one end of this to the other, taking just 80 strides to make the distance. If at first too few are taken, repeat it, endeavoring to shorten the stride a little so as to make the 200 feet in 40 double steps.

THE force and value of black powder is often overlooked in these days of high-grade nitro explosives. There are places where black powder, or the more modern "low" nitro powder, does the work required more satisfactorily and less expensively than high-grade powders will. In the case of moving or shattering large banks of gravel or comparatively soft and shattered rock, the low-grade explosives are often as effective as the high grade. At the Blue Point gravel mine in Yuba county, Cal., some years ago a charge of 50,000 pounds of black powder was laid, which dislodged 150,000 cubic yards of gravel. The powder was distributed in a system of drifts. The main drift, 3x4 feet, was run in 275 feet. From this there were lateral branches, six on either side, each 80 to 120 feet in length. The powder was fired by electric machine, the contact being made at ten different points. At the Dardanelles hydraulic mine, near Forest Hill, Placer county, Cal., 36,000 pounds of "low" nitro powder were fired in a single blast and dislodged 500,000 cubic yards of gravel. The face exposed was 175 feet high and 1000 feet long. The material was gravel of fairly even character, with comparatively few large boulders. Under this bank 1200 feet of drifts had been run, in which the powder was distributed. This charge was also fired electrically. Dynamite is comparatively ineffective when charged in small holes in gravel banks, but under some circumstances when placed in drifts in comparatively large amounts it has accomplished relatively more work than an equal cost in black or "low" nitro powder. An instance is cited where 3500 pounds of 40% dynamite broke 200,000 cubic yards of gravel.



Gold Dredging in Oroville District, Cal.\*

Written by L. J. HOBL.

Gold dredging is one of the recent methods for working the auriferous gravel deposits. The industry is still in its infancy, but, from all appearances, in a very healthy one, promising a steady growth and a long lease of life. New fields adapted to this method are being discovered, and with the progress of improvements in the application of the fundamental ideas involved, fields, which at present do not seem promising enough, will eventually become fit for exploration.

The first dredger in the Oroville district was built by the Risdon Iron Works for the Feather River Exploration Co., being a 3-cubic-foot bucket dredger, which was finished in March, 1898, and is still in active service. It was followed by the Plutus, a harbor dredger altered to suit the requirements of a gold dredger. This dredger was not a success and was abandoned shortly after going into commission. Almost contemporaneous with the construction of the Plutus, the Kia Ora and Marigold No. 1 were built, both of them being Risdon boats with 3-cubic-foot buckets; the former is still running, the latter was taken out of commission about a year ago. The next boat was the California, similar to the Plutus, and also abandoned some time after its installation.

Late in the year 1899, the advent of electrical power in the district gave an impetus to the dredging industry, and we find the boats built previous to that time changing from steam to electricity, and after 1900 there was no boat built in the district but what used electric power.

The boats built in the district from 1900 to the present time are below given in their chronological order:

Lava Beds No. 1, a dipper dredger built by the Marion Steam Shovel Co. Oroville Dredging Co., a dipper dredger built by local parties. Continental, a Bucyrus dredger, the first boat in the district with a close connected bucket line. Marigold No. 2, Risdon boat, 5-cubic-foot buckets. Indiana No. 1, a Bucyrus dredger of 3-cubic-foot buckets. Boston and Oroville, Nos. 1 and 2, Risdon dredgers of 5-cubic-foot bucket. Feather River Exp. Co., four Risdon boats of 5-cubic-foot buckets. Boston & California No. 1, Risdon boat of 5-cubic-foot buckets. Cherokee No. 1, Bucyrus boat, 5-cubic-foot buckets. American No. 1, Bucyrus boat, 3-cubic-foot buckets. Pennsylvania, 5-cubic-foot buckets. Golden State & Miners' Iron Works. Butte, Bucyrus boat, 3-cubic-foot buckets. Oroville Gold Dredging & Exploration Co., Risdon boat, 5-cubic-foot buckets. Indiana No. 2, Bucyrus boat, 3-cubic-foot buckets. Boston & California No. 2, Bucyrus boat, 5-cubic-foot buckets. Lava Beds No. 2, Bucyrus boat, 5 cubic-foot buckets. El Oro No. 1, Link Belt Machinery Co., 5-cubic-foot buckets. American No. 2, Bucyrus boat, 5-cubic-foot buckets. Central No. 1, Bucyrus boat, 3-cubic-foot buckets. Leggett No. 1, Risdon boat, 5-cubic-foot buckets. Boston & California No. 3, 5 cubic-foot buckets, Marion Steam Shovel Co. Viloro, Bucyrus boat, 5-cubic-foot buckets. Lava Beds No. 3, Bucyrus boat, 5-cubic-foot buckets, about completed. Oroville Gold Dredging & Exploration Co. No. 2, Bucyrus boat, 5-cubic-foot buckets, building.

The following table shows the number of boats in the Oroville district at the present day, their make and size of digging apparatus:

NAME OF COMPANY OR BOAT.	Bucyrus Boat.		Dipper Dredger	Golden State and Miners' Iron Works—5 Cu. Ft.	Link Belt Machinery Co.—5 Cu. Ft.	Risdon Iron Works.	
	3 Cu. Ft.	5 Cu. Ft.				3 Cu. Ft.	5 Cu. Ft.
American	1	1					
Boston & California						1	1
Boston & Oroville.							1
Butte	1						
Central	1						
Cherokee		1					
Continental		1					
El Oro.					1		
Feather River Exp. Co.						1	4
Indiana	2						
Kia Ora						4	
Lava Beds		12					
Leggett							1
Marigold							1
Oroville G. D. Co.			1				1
Oroville G. D. & Exp. Co.		*1					
Pennsylvania				1			
Viloro		1					
Totals	5	8	1	1	1	2	10

\* Risdon boat, with Bucyrus bucket line.  
† Risdon boat being equipped with Bucyrus bucket line,  
One of the boats about ready to start.  
\* Boat under construction.  
† Bucyrus boat, with Risdon revolving drum.

\* Abstract Trans. Cal. Min. Assn.

In no State are there so many dredgers working as in California, and at no place in California are there more than in the Oroville district, where to-day twenty-eight are running, two about ready to run and at least four more contemplated.

The other fields in California invaded by dredgers are the following:

Yuba river, about 12 miles above Marysville. Bear river, near Wheatland. American river, below Folsom. Calaveras river, at Jenny Lind. Sacramento river, above Redding. Clear creek, a tributary of the Sacramento river, below Redding, where a suction dredger is operating. Trinity river, at Poker Bar and at Trinity Center. Callahan, Siskiyou county, Scott river.

DESCRIPTION OF DREDGERS AND GENERAL FEATURES OF DIFFERENT TYPES.—A gold dredger consists essentially of a boat provided with appliances for the handling of the boat, digging the material in front of it, disintegrating and washing it, saving the gold contained in it and delivering the debris in the rear of the boat in such a manner as not to interfere with the movements of the boat.



Gold Dredge in Operation, Oroville District, Cal.

From the manner in which the gravel is excavated and delivered to the disintegrating, washing and gold saving devices two classes of dredgers can be distinguished, namely, the dipper dredger, where one large bucket is used for excavating, similar to the steam shovel used for excavations for canals, railroad cuts, etc., and the continuous bucket or bucket and link type, where an endless chain of comparatively small buckets, running over suitable tumblers, is used for this purpose.

The foregoing table will show that there is only one of the former style of dredgers now in use in the Oroville district, and its discussion will be left out of this paper, for the reason that this type has become obsolete and is not likely to be adopted by anyone contemplating the installment of a modern dredger.

I will only say that the reasons for this abandonment are the small yardage handled by such a boat and the crowding of the gold saving appliances by the sudden discharge of a voluminous bucket.

The hull of the continuous chain type is rectangular in ground plan, with slightly reduced width of the bow of the boat, and is constructed of timber. No one in the Oroville district has figured on a steel hull, but dredgers going into Dutch Guiana are being constructed with steel hulls. On the bow of the boat rises the bow gantry, from which is supported the lower end of the digging ladder. About the center of the boat the main gantry supports the upper end of the digging ladder and the main drive of the bucket chain. This gantry in the case of the latest type of the Risdon boat is constructed out of steel plates and shapes.

To allow the digging ladder and its chain of buckets to descend to the bottom of the ground to be worked, the hull from the main gantry forward is in two parts, separated by an opening, called the well hole, in which the ladder travels up and down.

The stern gantry supports the tail sluices, conveyor ladder, spuds, if there are any, and all the gentries are securely tied and braced to each other.

The general dimensions of the hull are: Width from 32 to 40 feet, length from 76 to 116 feet, depth from 7 to 9 feet, according to the size of buckets used and depth of proposed excavation.

The bucket line, as already stated, is either a close chain, where bucket follows bucket, or an open one, where buckets and links alternate, the former being

used on all the boats with the exception of the Risdon. The speed of the bucket line varies from 42 to 52 feet per minute. As to the merits of the close chain as against the open, it will occur to the most casual observer that the close chain can dig more, as with the same speed there are more buckets delivered in the same space of time.

The only place where the open chain might have an advantage would be in ground containing very large boulders. The buckets themselves vary in size, shape and makeup, but it can be generally stated that a cast steel bottom piece, with sheet steel hood and manganese or nickel-steel lips, the latter with reinforced cutting edges, has been shown to be best adapted to the work so far.

The shape of the bucket is also important, and the best types are so arranged as to deliver the material freely and not carry any appreciable quantity back into the well hole. To arrive at this condition, it is of advantage to give the bucket hood a rounded shape as against an oblong one. The first dredgers built by all the manufacturers worked under the difficulty of having the bucket bottoms made too light

and they suffered severely on account of this. Whenever an existing dredger had to renew its bucket line a heavier pattern of bucket bottom was adopted, and particular stress was laid on the proper distribution of the added metal to such parts of the bottom showing an intrinsic weakness or a greater liability to wear.

The weakest portions of the bucket bottoms are the eyes and the parts coming in contact with the manganese or nickel-steel wearing plates of the upper and lower tumblers. The pins connecting the buckets to each other or to the links are made in different styles from different materials, varying in diameter from 2½ inches to 4½ inches. The material which has so far given the best results in the larger size pins is a steel of about 0.55 carbon, while manganese steel has shown good wear on the smaller pins and is quite extensively used for such.

The pins work against bushings, generally made of manganese steel, and so far this material has given satisfaction.

The lower tumbler of the Risdon boat is of pentagonal shape, while on the other boats it is hexagonal. It consists of two cast-steel cheeks mounted some distance apart on a connecting thimble, the cheeks being lined with wearing plates of manganese or nickel steel at the points exposed to a contact with the buckets. In modern practice the lower tumbler is connected rigidly to a shaft, turning in bearings fixed to the lower end of the digging ladder, early attempts to have the lower tumbler turn on the shaft having proved disastrous failures.

The details of the bearings vary again in different boats, provision being made in all cases to tie the two sides of the digging ladder together at the bearings, either by means of the lower tumbler shaft itself, or by separate devices, so as to keep the ladder from spreading. It can be said that these devices have proved the more efficient the simpler they were; and it might be stated that simplicity of the construction of details is the criterion of a good dredger.

The upper tumbler consists of a cast-steel core, mounted on the main driving shaft and provided with proper manganese or nickel-steel lining plates for engaging with the buckets, pulling them up and guiding them. The Risdon boats have a square up-



per tumbler, while the earlier Bucyrus boats, the Link Belt and others use a pentagonal shape. The latest Bucyrus boats have a hexagonal one. While from a purely theoretical standpoint the square shape is most efficient in dumping the bucket quick and effectively, practical working shows that with this type of upper tumbler there is quite a blow attending the settling down of each bucket on its bearings on the tumbler; this blow is less on a pentagonal tumbler and still less on the hexagonal one; on this latter, however, the material is not delivered as freely as with the others, especially does this hold good for ground containing clay in large quantities.

In the latest boats the upper end of the digging ladder is suspended from the upper tumbler shaft, which is good practice, as

the breaks occurred with a plate girder type, the other with a braced box girder. The ladder is provided with rollers for the support of the up-going bucket line.

As a rule, the diameter of these rollers is too small and they do not turn very freely, so that they are subjected to sliding friction, a condition which is as undesirable for the rollers as for the buckets sliding on them. There have been rollers made with mangause shells and they have given good satisfaction.

The main drive, that is, the drive actuating the bucket line, is generally efficient on all the boats. As a matter of fact, the motors in connection with this work, as a rule, are too large in capacity and, therefore, not economical. As will be shown later on, the

sudden large cave and does not strain the hull of the boat as much as a spud.

The spud, it is claimed, gives a better chance to work hard ground by holding the boat up to the work. There have been quite a number of failures of spuds in the district, and as a consequence, spuds were constructed which were entirely too heavy. To show the extremes I give the section modulus of three spuds: No. 1, used on a 3-cubic-foot boat, 288; No. 2, used on a 5-cubic-foot boat, 562; No. 3, used on a 5-cubic-foot boat, 1096. While spuds Nos. 1 and 2 were broken on account of faulty design, spud No. 3, which is working in exceedingly hard ground, has not shown signs of giving way, and probably will, it being about twice as strong as No. 2. After the excavated material leaves the buckets it is first received by a hopper, which in the modern dredger is arranged with a gravel cushion for the material to drop on, thus saving valuable steel lining bars, which were used in the earlier types and are still in use in some boats of more recent construction. From this hopper it is delivered into a revolving drum or shaking screens, where it is disintegrated and washed, the finer material falling through perforations onto the gold saving riffles, the larger stones and gravel being conveyed by the drum or shaking screens to the tailing stacker or conveyor.

The Risdon boats throughout use the revolving drum, the others, with the exception of two, the shaking screens. It is claimed by the advocates of the revolving drum that it disintegrates the material better, especially in clayey soil. While this may be true, there is to-day a great deal of such material handled successfully by shaking screens. The advocates of the shaking screen claim for it a better distribution of the material on the gold saving devices and cheaper repairs, also greater accessibility.

The question of drum versus shaking screen is one that must be decided from the nature of the ground likely to be encountered by the dredger, and even then there is a large margin left for individual likes and dislikes. A combination of the two might be advantageously employed by having the perforations in the drum of large size, thus eliminating only the largest gravel and boulders, then do the final grading on the shaking screen, thus accomplishing two objects, namely, relieving the shaking screen of a good portion of its load and of the tendency to clog, and separate at once the lumps of clay, which are always sluice robbers. The objection of bad distribution would also be solved by this method.

This drum could be improved upon by making it hexagonal or octagonal, so that the individual sections would be planes which could be replaced easier than curved sections. The water for washing is furnished by centrifugal pumps, mostly directly coupled to motors and this part of the dredger equipment is, as a rule, the most inefficient. From data obtained at various times by the author and others, the efficiencies of these pumps vary from 25% to 50%.

The fault is not altogether attributable to the pump manufacturers, as the exact conditions under which the water is to be delivered by the pump are not known to them with sufficient accuracy, but that they have never tried to determine by actual measurement just what these conditions are seems an anomaly. The importance of such investigation should be kept in mind, and it is hoped that before long we will be in shape to specify the conditions under which the pumps are supposed to work.

The riffles on which the gold is saved show in the modern style of boat a return to the well-known Hungarian rifle, with slight modifications to suit the conditions.

(TO BE CONTINUED.)

THE cost of producing copper at Rio Tinto, Spain, is stated to be about \$1.55 per ton, divided as follows: Mining, 80 cents; roasting, about 18 cents, including labor in building heaps, etc.; precipitation and collecting, about 56.6 cents. The cost of labor in that portion of Spain is low and supplies are nominal in cost. At these mines sixty-six tons of ore are required to produce one ton of metallic copper. The cost of producing one ton of metallic copper by the cementation process as carried on there is about \$144.



Bucket Ladder of Dredge in Operation.



Gold Dredge Working Inland, Showing Tailings Stacker.

the eccentricity of the suspension of the ladder at some point forward and below the upper tumbler shaft causes the buckets to leave the ladder rollers, which should guide them on the upper tumbler, whenever the ladder is not low down. The digging ladder itself is either of the plate girder type or a box girder stiffened by truss rods. In the case of the boats recently completed on the Yuba river it consists of a bridge truss made up out of angles.

The depth to which the digging ladder reaches varies from 30 to 60 feet below the water level, the latter depth being reached by the just mentioned boats on the Yuba river. While to my knowledge there have been but two cases where a ladder broke, they have been caused not by an intrinsic weakness of the ladder, but were secondary effects of a break in some other part of the appliances on the boat which caused the ladder to drop suddenly. One of

power used for the main drive is from 40 to 60 H. P., with possible peak loads for very short periods of 75 to 100 H. P., while the motors installed are from 50 to 100 H. P.

The winches governing the head and side lines or the side lines and the spuds, while differing in design, are generally efficient, only in the earlier boats they have been made rather too light in some details. In the more recent boats provisions are made for a fast speed on these winches to enable the rapid taking in of the slack of a rope. The Risdon boats throughout work on a head line, the Bucyrus boats, with one exception, on spuds.

The head line has the advantage of giving an easier distribution of the tailings and makes the use of the sand pump almost superfluous, an advantage particularly desirable in working against a high bank; it also gives the boat a chance to back out of a



## South African Methods.\*

Written by THOMAS H. LEGGETT.

There is certainly no other State in the Union than California that has contributed so largely in men and brains to the development of South Africa. The opening up, upon a true mining basis, of the De Beers diamond mines at Kimberley was begun in the eighties, under the direction of a Californian, Mr. Gardner Williams, a graduate of Berkeley, and the management has descended to his son, a graduate of the same institution; and in the gold mines of the Witwatersrand many of the most famous properties have been opened up by California consulting engineers and managers. Hence, it is natural that Californians in general, and California mining men in particular, should have kept more closely in touch with the work being done in these fields.

The main reef series, which is the payable series, has been accurately located over a length of 47 miles roughly east and west along the strike, and it is safe to say there is not a square inch of ground in that distance that is not owned by some mining company. To my mind, it is a fortunate thing that the mining laws of that country are so simple and direct. Each mining claim, which is in size about 155 feet by 413 feet, is bounded by vertical planes. There is no law of the apex and, in consequence, there has been an absolute dearth of mining litigation, while the mining law expert is an unknown quantity. In order to secure sufficient ground on the dip of the reef or vein, one simply locates parallel claims on the dip; and this latter, I may remind you, is often as flat as 15° to 20°, while on the eastern flank of the Rand, boreholes have shown it to be as low as 6° to 8°. The practical results of the working of this mining law have certainly been most satisfactory, and this in a country where the value of the mining claims has risen fabulously during the past ten years. For instance, claims lying on the dip of the reef, and where the latter lies at a vertical depth of over 5000 feet, have been sold for over £1000 per claim, equivalent to an area of a little less than one and one-half acres.

The outcrop mines are nearly all worked by incline shafts, and only a very few of these have as yet been worked out, those having an area of but a few claims. Behind these outcrop mines, that is to say, to the southward, on the dip of the reef, comes the first row of deep-level mines. Of these there are fifty-five vertical shafts, the average depth of which is about 1200 feet to the reef. There are fifteen producing mines now at work in this row. In the second row of deep-level mines the average depth of twenty-two shafts is 2600 feet to the reef, but thus far there are only two or three of these properties that have reached the producing stage. The average depth of the shafts in the third row of deep-level properties is about 4500 feet, and I do not know of any property in this row that has yet reached the main reef series. There are mines in this third row of deep levels that will require shafts 5000 feet deep, but 4000-foot shafts are now getting to be common on the Rand. These very deep shafts have called for the skill of the mechanical engineer perhaps even more than that of the mining engineer. Here again we find a Californian to the front in the masterly treatise of H. C. Behr, on "Winning from Deep Shafts." The usual deep shaft has four hoisting compartments, each 5 feet by 6 feet inside of timbers, and one pump and ladder way of 6 feet by 6½ feet. This is sometimes exceeded, as in my own experience, where the conditions permitted the working out of a single deep-level property of 260 claims through a single seven-compartment shaft. This shaft is now sinking to a depth of 4000 feet, and has six hoisting compartments. The record for quick sinking is held by R. M. Catlin in the Howard deep-level shaft of the Consolidated Gold Fields of South Africa, where he sunk 203 feet in one month in a shaft 28 feet 8 inches by 6 feet inside of timbers, and averaged 153 feet per month for a period of nine months, at a cost of about \$80 to \$90 per foot. In view of the deep mining now being done in the Lake Superior region, there has never been any doubt in the minds of the consulting engineers of the Rand but that the mechanical problems connected therewith could be readily solved.

But the question has naturally arisen as to what depth mining would ultimately reach on the Rand. This touches closely upon the matter of the gold contents of the reefs and their payability. With the object of endeavoring to form some idea of how much gold there was in the known area of these reefs, I, with Dr. F. H. Hatch, in 1902, prepared an estimate of the gold production and life of the main reef series down to 6000 feet. This does not mean that in our opinion the Rand reefs would be worked everywhere to a vertical depth of 6000 feet; but, as it was necessary to get some limit, and as it is evident that the reefs could be worked out to this depth without sinking a single vertical shaft of 6000 feet in depth, but by means of incline shafts at the bottom of the verticals from 4500 to 5000 feet deep, we felt it safe to estimate the gold contents to this limit. There is no doubt in my mind but that the miners of the Rand will feel their way to these greater depths in the future just as they have done in the past.

\*Abstract Trans. Cal. Min. Assn.

The profitable yield from the first row of deep-level mines encouraged the more strenuous development of the second row, the mines of which are now reaching the producing stage; and this, I take it, will be the case with the third and any successive row. My personal opinion is that beyond the third row of deep levels there will be very few vertical shafts, as it will be feasible to work out payable ground by long inclines from the bottoms of the shafts already projected and in course of sinking. One may naturally ask why this method has not been followed in the past and not so many deep-level companies formed. The reason is simply a financial one—that, so long as the reef lay within readily workable depths, the quicker the gold was extracted the more profitable the operation of extracting it became. Therefore, it is only now when greater depths have been reached that a halt has been called in the formation of these companies that now lie rank upon rank, one above the other.

Dr. Hatch and I found that from 47 miles of known reef there had been produced up to Dec. 31, 1901, £76,762,291, and there remains to extract to a depth of 6000 feet £1,233,560,709. The production of the Rand for 1898 was £15,141,000 and for 1899 it was at the rate of £19,000,000, the increase of production for the three years preceding the war being about £4,000,000 per annum. As you know, the recovery of the industry since the war has been extraordinarily slow. For 1903 the production was £12,589,000, and this year the production will be about £15,800,000. Before the war there were erected and in operation about 6400 stamps, while to-day there are erected and only awaiting the necessary labor to run 7500 stamps, with many more projected. The increase of stamping capacity in 1898 and 1899 was 2195 stamps, or about 1100 stamps each year; this rate of increase will, I think, soon be exceeded. Dr. Hatch and I estimated that in a very few years the annual production of the Rand would reach £30,000,000 per annum, and I think, in view of the foregoing figures of the enormous stamping capacity, you will agree that this is a very reasonable estimate. On the basis of this average annual production of £30,000,000, the life of the Rand would be about forty-two years.

It is on account of the regularity of the ore deposit that such immense capital expenditures as have been made on the Rand are permissible. At the same time, it is nothing like as regular as the reader of a descriptive account of the ore deposit is apt to imagine. The reef series is intersected by innumerable dikes, which cut through the strata at all angles. It is faulted and thrown very quickly, the throws sometimes amounting to a lateral displacement of hundreds of feet, while the sudden curving of the enclosing quartzitic sandstone, together with the capping of the later coal measures, has sometimes obliterated all trace of the reefs on the surface for distances of from 1 to 2 miles. Only by the most painstaking and persistent diamond drill boring have they been able to locate the payable reefs across such a gap as I have described. In consequence of these disturbances the underground work is sometimes most troublesome and complicated.

To attain the output indicated in the foregoing, of course additional labor is necessary. The Rand has been much hampered through the lack of sufficient labor. H. H. Webb has shown that before the war there were about 107,000 Kaffirs employed in the Witwatersrand mines. The Transvaal Chamber of Mines reports that at the end of October, 1904, there were 71,661 natives at work and 12,963 Chinese. The shortage of Kaffir laborers, as compared with the pre-war days, is, therefore, very considerable, and is due to a multiplicity of causes which it is not necessary to enter into here. Perhaps the chief cause is the reluctance of the Kaffir to work, and the explanation of this lies in the fact that wherever nature is prodigal in the products of the soil, life is rendered so easy that the average native has no necessity to labor. It is stated on good authority that there are 6,000,000 Kaffirs south of the Zambesi river, and yet it has always been difficult to get a sufficient complement of Kaffir laborers, not only for the mines, but for all industries in South Africa, and I presume this will always be so. This great need of labor has recently been met by the introduction of Chinese, and as this step has brought forth much severe criticism from people who are not fully aware of the conditions that call for it, I think it may be well to explain them here.

First, I may say that the introduction of the Chinese into South Africa is not at all on all-fours with their introduction into America, Australia or similar countries, and, for this reason, that in the Transvaal there exist already two distinct classes of labor, namely, that performed by the white and that performed by the black. The presence of the Kaffir in such overwhelming numbers establishes this distinction and nothing can change it. We all know that where white and black laborers come in contact there are certain things which the white man considers it "infra dig" to do, and the latter is most strenuous in maintaining this position. On the Rand the Kaffirs do all the drilling in the stopes, running of cars, shoveling, etc., and on the surface the firing of the boilers, shoveling in the cyanide tanks and similar labor, while the white man does the bossing. This has been so ever since the mines started. The

Chinaman in entering that country is not put into competition with the white man, but is put upon the lower plane of labor which already exists there. He is employed only at Kaffirs' work. Recently enacted and most strict legislation has so safe-guarded the white man in the Transvaal that there is not the slightest danger of the Chinaman ever going outside of his sphere of work. In America and Australia, on the contrary, as soon as a Chinaman lands he is at once in competition with all other classes of labor. It is evident, therefore, that one can not reason from analogy and exclude the Chinaman from South Africa as he has been excluded in the countries named, since the conditions are entirely and fundamentally different. Although I have not been on the Rand since the introduction of the Chinese, I learn from reliable sources that they are turning out most excellent workmen, and mines that have had their stamps hung up for the past two years—and even longer—are now able to resume operations. As for their physical well-being, fellow engineers inform me that they are most excellently taken care of; in fact, the danger is of erring too much in that direction. Hence, I think we can safely say that the introduction of the Chinese upon the Rand is a pronounced success. Chinamau are obliged to be returned to China at expense of the employing company at expiration of contract. This and all other gold-producing countries must now look to their laurels, for in a very short space of time it is certain that the gold output of the Transvaal will so greatly increase that it will head the list of the gold-producing countries of the world.

The situation in South Africa was desperate when this step of introducing Chinese was at last decided upon. Numbers of mines had in their treasuries working capitals of from £100,000 to £250,000, and were unable to expend a penny of it for nearly two years through lack of the required labor. If a condition of this kind confronted you here on the Pacific coast I am satisfied you would not theorize about it, but would speedily take action to meet it, and this is just what the people of the Rand have done.

In speaking of the working capital necessary for the development of the deep-level properties on the Rand, I am telling you nothing new when I say that the mines in the first row of deep levels have expended from two and a half to three million dollars each for development and equipment before getting out a single ounce of gold. But with a gold deposit of pebble conglomerate lying in sedimentary strata, and proved by boreholes to a depth of 4880 feet, to say nothing of the hundreds of miles of workings now existing, this comprehensive policy of mine development has shown itself to have been not only well founded, but commercially successful. At the same time, like all policies, it has its limits and can not be carried too far in exploiting the deep-level area of the Rand without inviting disaster; hence my remark that the miners of the Rand will undoubtedly "feel their way" in the exploitation of the greater depths before undertaking too heavy expenditures in deep shafts.

(TO BE CONTINUED.)

## Piping Air Into Mines.

The Pennsylvania Legislature has had under consideration a bill introduced in that body which provides for conveying air to workers imprisoned in the mines in case of accident. This proposed law requires that in all pits that shall be started for the purpose of mining coal or clay after January 1, 1906, when twenty or more persons shall be employed therein, the owners must run pipes not less than 6 inches in diameter beneath the floors of all tunnels. Pipes not less than 4 inches in diameter are to be run beneath the floors of all passages. These pipes must connect with the main tube and open into the various headings.

While the primary purpose of the bill is to supply pure air to imprisoned workmen, the tubes will also be used as a means of hasty communication, or as a means of transporting water in case of fire. Mine foremen must inspect the working of the tubes and see that the entire system is in proper shape. Inspections must be conducted at intervals of not less than seven days, neglect to do so on the part of the foreman being a misdemeanor. The punishment will be a fine of not more than \$100 or imprisonment for not more than ninety days, or both.

## One Cause for Misfires.

TO THE EDITOR:—At various times I have read in the MINING AND SCIENTIFIC PRESS items in regard to "missed holes" in blasting. The reason for this is that when fuze is used in a cold climate without being thawed it becomes hard, and when the miner who is blasting ore uncoils the fuze it is hard and stiff, very often cracking or breaking. This causes a missed hole.

If the fuze is put in a warm drying room, under a stove, or put in a powder thawer about an hour before using, this will soften it, so it will be readily pliable, and, when uncoiled, will not break or crack. I have found that by thawing the fuze in this manner missed holes are less liable to occur. F. O. ALM.  
April 10.



Internal Combustion Engines.

Written for the MINING AND SCIENTIFIC PRESS.

Countries where fuel is expensive naturally offer the most fertile soil for the growth of high-efficiency prime movers; hence England and Germany have in past years outstripped the United States in the development of the internal combustion engine.

Fig. 1 shows the acceleration of the use of gas en-



Fig. 1—Curve Showing the Growth of the Gas Engine Industry in 200 European Cities.

gines in 200 European cities between the years 1881 and 1902. The internal combustion engine is still in its youth in America and does not yet enjoy the full confidence of the public; but the popularity which these engines are winning in central station, street railways and other important industries is fast bringing the engineering profession to realize its true value.

In its growth the internal combustion engine has been divided into distinct and characteristic types through the influence of local requirements and fuel resources. General conservatism, however, stimulated by the heavy death rate of some new ventures in the industry, has brought it into prominence.

The four-cycle engine owes its origin to Beau de Rochas and Otto. To the former belongs the honor of first formulating rules for the design of an economical heat engine and to the latter that of embodying the theories of his predecessor in a commercially practical engine.

In the four-cycle engine the inspiration and compression of combustible gases and the expulsion of the burned gases is effected directly by motion of the main motor piston itself. When the piston has advanced about half way on its expansion stroke, the gas which was previously compressed on the in-stroke to the predetermined space provided in the end of the cylinder, and the combustion chamber having been ignited at the instant the crank passed center, the pressure of the gas expanding under the high temperature produced by its own combustion delivers its energy to the crank shaft. On the return stroke the exhaust valve is opened and the returning piston expels the burned gases. As the engine again passes center the exhaust valve is closed and the admission valve is opened, allowing a fresh charge to be drawn in. The gas and air are supplied to the mixing valve through separate regulating valves, the one being on the gas main and the other on the air line which terminates at the hollow frame of the engine, through which the air supply is taken, the metallic parts being thus cooled and the hollow frame acting as a silencer for the inflowing air.

The cylinder and combustion chamber are water-jacketed. High economy in gas engine practice depends on the degree of compression which can be carried or the amount of gas which can be made to occupy the clearance spaces of the cylinder and the combustion chamber at the beginning of the stroke. On the other hand, since the temperature increases quite rapidly with the pressure, and unless cooling methods are provided, the degree of compression at which the richer gases will ignite spontaneously will soon be reached. Obviously any heat carried away by the cooling water is lost, and no more cooling should be done than is absolutely necessary to admit of the desired compression.

Rich gases, or those in which the percentages of free hydrogen and volatile hydrocarbons are large, ignite at a much lower temperature than the leaner ones in which these constituents are less predominant. For the same cooling effect compression of the former gas can not be carried as high as that of the latter, and for the same degree of compression a greater cooling effect is necessary in the former case than in the latter.

Ignition is effected in both the four and two-cycle

engine by means of magnetos, the leads from which terminate in an ignition plug inserted in the cylinder head. These plugs, when pushed home, seat on an asbestos gasket and are secured by four studs. The stationary rod which forms one terminal of the magneto is insulated from the metallic portion of the plug by two tapered porcelain plugs. The movable rod which forms the other terminal of the magneto is free to turn in its bushings and actuated by the valve mechanism driven from the igniting gear shaft from

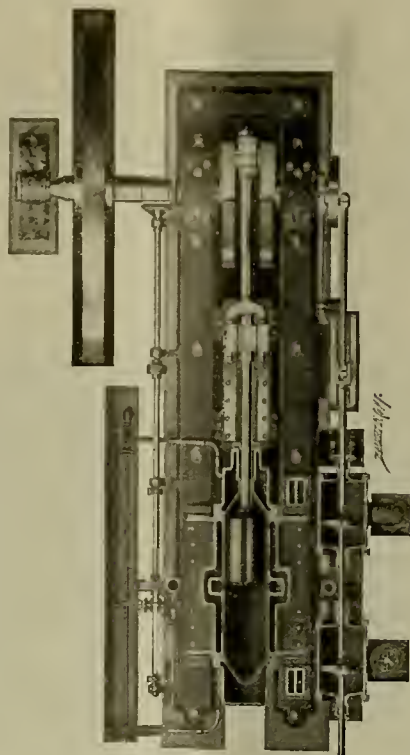


Fig. 2—Transverse View Four-Cycle Koerting Engine

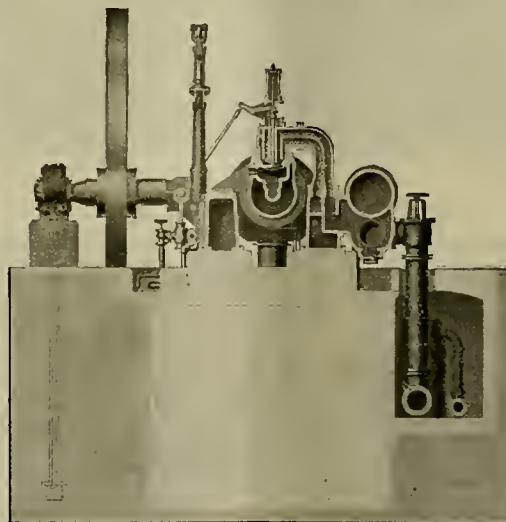


Fig. 3—Sectional View of Koerting Gas Engine.

the main engine shaft. The mechanism which drives the magneto is so arranged that the armature is first turned slowly through about one-third of a revolution against a spring. At the instant the charge is to be ignited the magneto lever is disengaged, and the spring gives the magneto armature a quick jerk back to its original position, sending a high-pressure electrical impulse through the igniting plug terminals, which break contact at the proper instant, and the hot igniting force thus formed ignites the charge. In the larger size engines two igniters are operated in unison, and the large charges, being ignited at two points, insure uniform combustion.

Following is a report of tests made on the Koerting four-cycle engine. In these tests gas of about 500 B. T. U. per cubic foot was employed:

ENGINE No. 4190.						
	Revolutions Per Minute	B. H. P.	G. H. P.	Gas Used Per Hour (Cubic Feet)	Gas Used Per B. H. P. Hour	Thermal Efficiency on B. H. P.
Full load.....	101	108.10	1892.9	17.51	0.019	38.2 %
¾ load.....	163	82.46	1565.5	19.35	0.094	.....
½ load.....	165	74.37	1472.6	19.83	10.211	.....
¼ load.....	165	55.28	1184.4	21.65	11.158	.....
No load.....	167	37.38	987.4	26.41	13.604	.....
	163		805.1			.....

ENGINE No. 4184.						
Full load ..	160	107.5	1831.4	17.04	8.774	29.05 %
No load ..	162				673.8	.....
ENGINE No. 4034.						
Full load ..	141	115.2	1922.5	16.69	8.707	29.23 %
¾ load ..	142	76.93	1507.2	19.59	10.112	.....
ENGINE No. 4210.						
Full load ..	140	114.22	1902	16.66	7.962	31.96 %
¾ load ..	140	76.64	1453	18.97	8.500	.....

These engines are to be built by the De La Vergne Machine Co. of New York, which company has the exclusive right to manufacture and sell them in the United States.

THE PROSPECTOR.

"Gossan" is a Cornish term meaning iron capping of a vein. This is called by the French "chapeau de fer," or iron hat. Copper veins in regions that have been drained by nature often have a gossan, or iron cap, the result of the oxidation of the iron and copper sulphides. The copper leached from the partially oxidized ores, as the process of oxidation proceeds, is carried downward by the ground waters and is often found redeposited in the form of carbonates, oxides and enriched copper sulphides, such as bornite and copper glance. In geology a dike is a sheet or mass of igneous rock which has been intruded into older, pre-existing rocks. Quartzite is of sedimentary origin and therefore contemporaneous with the sedimentary rocks inclosing it, and cannot therefore properly be considered a dike, though often so spoken of. Miners also improperly speak of a limestone dike, sandstone dike, etc. Quartzite is not an igneous rock, but of sedimentary or aqueous origin. It varies in texture from very fine grained to coarse. It has usually a splintery to conchoidal fracture. Before being metamorphosed to a dense hard rock quartzite was a sandstone, and previous to that a bed of sand. The cementing material is usually largely silica, though iron and carbonate of lime may also be present. Quartzite occurs with limestone, slate, shale and various schists. Mica is also often present. Feldspar crystals are often seen in quartzite when it has been intruded by an eruptive rock. The condition described as occurring at Quartzsite, Ariz., may be due to the formation of several beds of sand alternating with several beds of fine mud on the floor of an ancient ocean, the sand and mud having subsequently metamorphosed into quartzite and slate, or a formation consisting of a single layer of quartzite, with slate above and below, might be compressed into a series of folds which would cause the several beds to be repeated where the upturned edges of the folds were exposed by erosion; or a series of faults might cause a single stratum of quartzite to be repeated on the mountain side. A series of such faults would be approximately parallel with the strike of the quartzite reefs. It is impossible to give the true explanation of the occurrence referred to without carefully examining the entire district. An intrusive granitic rock (aplite), which consists of quartz and feldspar, usually rather fine grained and containing little or no mica, is often mistaken for quartzite, particularly when the rock has been silicified, and pressure has rendered the rock somewhat schistose.

The rock samples from the Volcano mine, near West Point, Cal., are determined as follows: Nos. 1 and 2 probably originally diorite, now much altered, and consisting of chloritic scales and feldspathic mineral with veinlets of calcite. It may be a dike, or may be simply an alteration of the country rock. No. 3 is grano-diorite, somewhat altered. Nos. 4 and 5 are also grano-diorite, but greatly altered. No. 6 is a portion of the country rock and apparently lies in the zone of mineralization and may be considered a portion of the vein, as it carries abundant pyrite and quartz. No. 7 is grano-diorite, containing quartz, feldspars and hornblende. No biotite is observed in this rock.

The two mineral specimens from Placerville, Idaho, are determined as follows: No. 1 is principally pyrite (iron sulphide) in a gangue of what appears to be a feldspathic dike rock; the bright lead colored mineral resembling galena is jamesonite, a composition of lead, antimony and sulphur. No 2 is a feldspathic eruptive rock, probably felsite; it is somewhat altered and carries some pyrite, and is probably the same as the specimen No. 1, without the sulphide minerals.

Rock sample No. 1 from Silver Star, Mont., is quartz (white) with hematite (red). The green scale on one side is talc. No. 2 is an iron manganese compound—manganite. The composition of the mineral varies more or less.

The rock specimens from Poker Flat, Cal., are essentially the same thing. They are largely composed of feldspar, with the infiltration of silica, and iron sulphide. The rock is evidently of igneous origin, but too much altered to make determination definite. Such rocks are sometimes gold-bearing.

The rock sample from Leete, Nev., is pitch stone (not pitch blende). It is a glassy, volcanic rock.

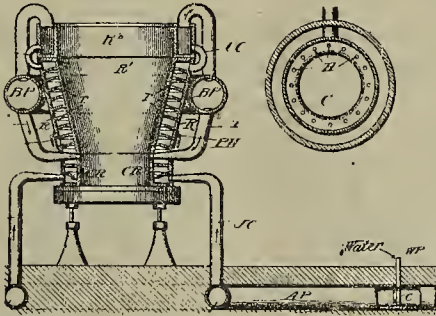


## Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 4, 1905.

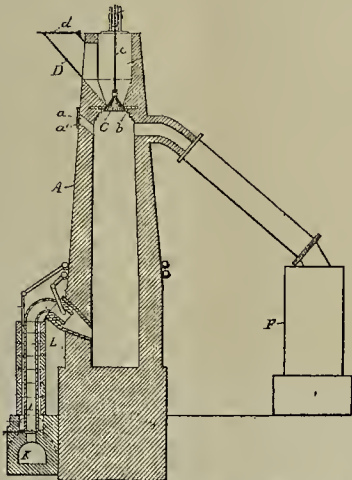
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

SMELTING FURNACE.—No. 786,121; P. Healey, Campbird, Colo.



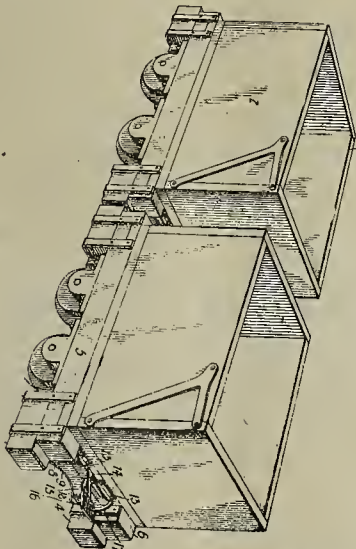
Combination with double-walled blast furnace; of air pipe for introducing air between walls, and spraying device in air pipe located at point outside of point where air pipe enters outer wall of furnace for charging air with atomized spray of water and cooling inner wall thereby.

FURNACE.—No. 786,746; G. L. Fogler, Pittsburg, Pa.



Gas heating device comprising outwardly stack of refractory material, gas flue through stack, tuyere in furnace, gas flue connecting gas supply with tuyere, valve at bottom of gas flue, heat flue surrounding gas flue having inlet at its top and outlet at bottom, chimney connected with outlet, and pipe adapted to feed gas into inlet.

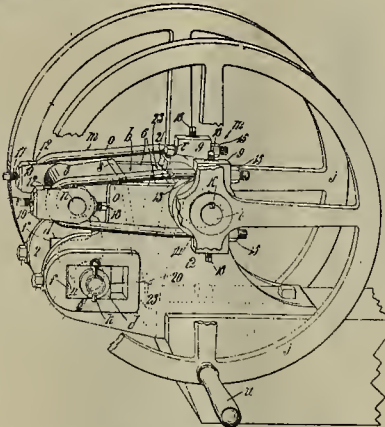
MINING CAR BRAKE.—No. 786,361; J. C. Jones, Coffeen, Ill.



Plurality of mining cars each having slidable bumpers, brake elements connected with said bumpers to obtain the automatic setting thereof, and means for effecting the manual setting of said elements, including a lever moved by the weight of an operator. Plurality of mining cars each having at each end slidable bumpers projecting at their outer ends beyond the car frames and carrying brake shoes at their inner ends, a foot-operated lever operatively connected with the mechanism to effect the manual setting of the brakes and means for releasing the

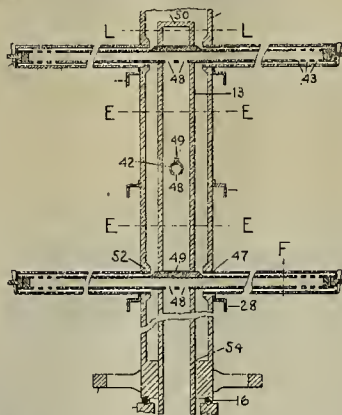
brakes. Plurality of mining cars having at each end slidable bumpers normally projecting at outer ends beyond car frame and carrying brake shoes at inner ends, cross-piece connecting each pair of bumpers, lever pivoted to car frame and having two arms pivoted to cross-piece and third arm provided with step and spring for releasing brakes.

ORE CRUSHER.—No. 786,265; A. C. Calkins, Los Angeles, Cal.



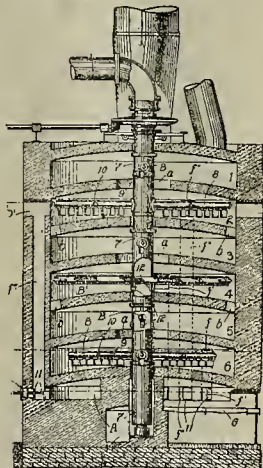
Ore crusher comprising frame forming crushing chamber open at front and bottom, and closed at rear and sides, vibratory jaw detachably and adjustably pivoted at heel to frame, and forming front of chamber, operating shaft at rear of chamber, reciprocating operating means extending from shaft alongside of chamber, and pivoted operating connection for vibratory jaw with such means, at top of chamber, jaw being movable on pivot, when lower pivot is detached, to swing out of open front of chamber and expose interior.

ROASTING FURNACE.—No. 786,567; W. R. Ingalls, Lynn, Mass.



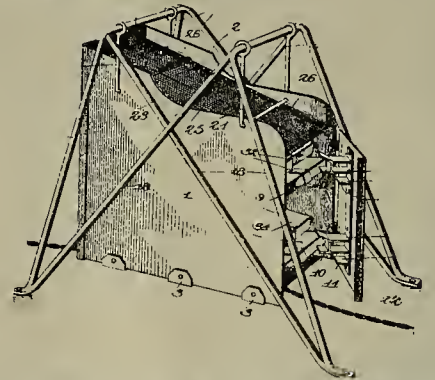
Roasting furnace comprising two or more superimposed hearths, flues under two or more of hearths, ducts connecting flues, means to cause gas burned in flues to pass successively through them in circular direction; and rotary stirring mechanism with arms projecting over hearths, stirring mechanism consisting of central vertical shaft with interior flue, hollow horizontal arms passing through shaft and communicating with interior flue by suitable apertures, portions of arms exterior to central vertical shaft being inclosed by other hollow arms, so as to leave open space between inner and outer arms, and means for circulating a cooling medium through shaft and arms.

ROASTING FURNACE.—No. 786,599; C. H. Repath and F. E. Marcy, New York, N. Y.



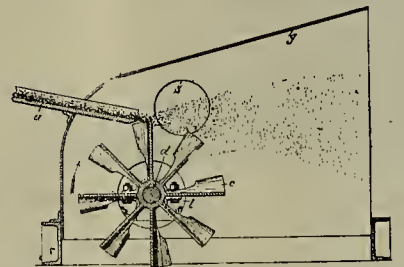
In furnace having plurality of superposed hearths, fire chamber located beneath bottom hearth of series, and independent flues located within walls of furnace leading from fire chamber to series of hearths.

ORE SEPARATOR AND CONCENTRATOR.—No. 786,322; W. F. Stein, Fort Collins, Colo.



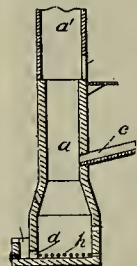
In machine of class described casing, concentrating pans arranged therein in oppositely inclined order, and doors carrying spacing elements projecting at different distances therefrom to hold pans properly positioned with relation to each other.

APPARATUS FOR SPRAYING BLAST FURNACE CINDER.—No. 786,573; W. Lessing, Geseke, Germany.



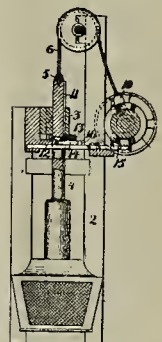
Apparatus for spraying glowing liquid blast furnace cinder, comprising in combination horizontally situated rotatable spraying drum, fixed on rotatable horizontal axle, fans projecting from surface of drum having undulated surfaces, adjustable channel for supply of material to be mixed with cinder, adjustable slag channel above drum, casing inclosing drum and accessories, having opening in upper part of casing for passage of slag channel, and having openings in walls of casing around ends of axle of drum.

PROCESS OF PURIFYING PIG METALS.—No. 786,048; J. B. Nau, New York, N. Y.



Process of purifying and enriching metals by pouring liquid metal upon mass of broken pieces of solid oxidizing material in such manner that liquid metal will be broken up and descend in small streams through spaces between and in contact with pieces of oxidizing material, causing a bath of liquid metal to accumulate, maintaining immersion of oxidizing material in bath, so that bath fills spaces in immersed mass of oxidizing material, for period desired, and separating liquid purified metal from oxidizing material.

STAMP MILL.—No. 786,590; A. McCombie, Grass Valley, Cal.



In stamp mill, vertically guided stamps and stems, crank shaft, ropes connecting with cranks, direction pulleys over which ropes pass, turnable connections between ropes and stamp stems and means including pivoted lever and connection operated from crank shaft for intermittently turning stamps during reciprocation.



### The Globe District of Arizona.

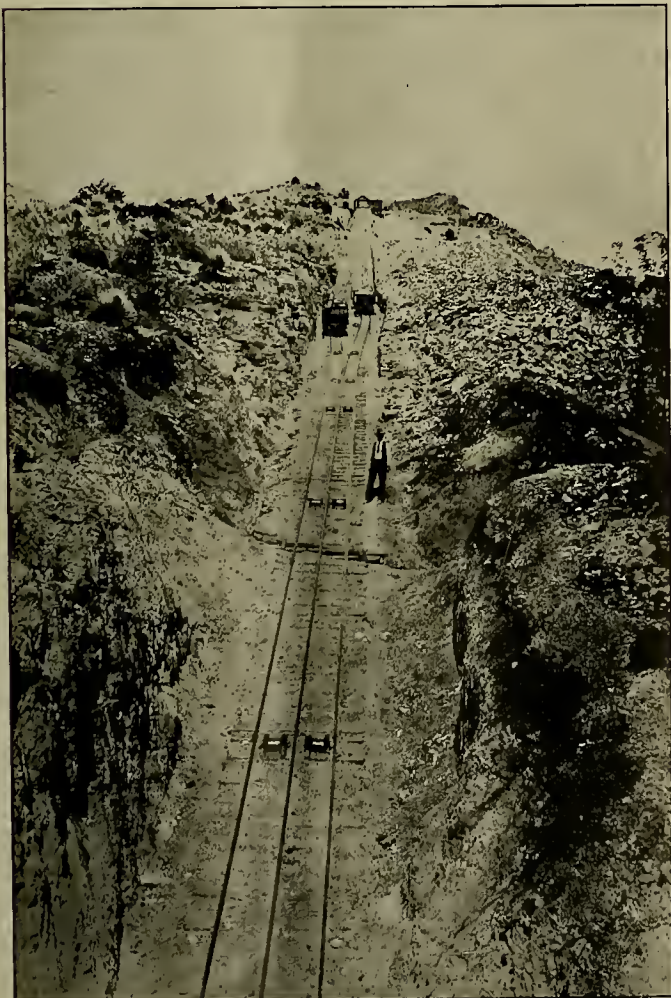
In eastern Arizona is one of the most noted and interesting copper districts of the Southwest. The most important mine in Globe district is the Old Dominion. This mine was discovered by venturesome prospectors who in 1874 crossed the Pinal mountains from the

westward. The Silver King mine was discovered by members of the same party on their return to Florence. The Silver King lies about 20 miles to the southwestward, on the west side of the range. Following this, discoveries were of frequent occurrence, and numerous small mining camps were soon established. The most of these newly discovered districts produced silver ore, but, with the exception of the

Silver King, few of them endured. The difficulties of existence on the desert, together with the depredations of the always hostile Apaches, were too serious drawbacks to be overbalanced by the promise of uncertain fortune. One of the noted districts of those early days was Richmond Basin, on the southwest side of the Apache mountains, its chief claim to notoriety being the finding of thousands of



View of Globe, Arizona.



Gravity Tramway, Clifton, Arizona.



Group of Mines, Globe, Arizona.



United Globe Mine, Globe, Arizona.



dollars' worth of nuggets of native silver, which occurred in the same manner as placer gold. Native silver and rich silver chloride ores were mined there, chiefly from the McMorris mine, for several years. McMillanville was also a noted and prosperous camp, owing its fame to the Stonewall Jackson mine, which also produced a large amount of native silver. The Silver King was the most permanent of these famous silver mines, being successfully worked to a depth of about 800 feet and producing several millions of ounces in silver. All of these mines are within the Globe region, but, singularly unlike the Globe ore deposits, the value of which is chiefly in copper. Globe eventually became the chief town and distributing point of the district. Gold as well as silver was produced by some of the mines of the district, but the first copper prospects were the Globe—later the Old Dominion—and the neighboring Globe Ledge, where a large amount of copper ore was exposed by superficial workings. The original Old Dominion mine is 4 miles north of the town of Globe. The ore occurs in quartzite. This mine is not that now known as the Old Dominion. It produced a considerable amount of gold and silver, as well as copper. It is owned by the Old Dominion Co., but has been idle for several years. The first development of copper on the Globe claim attracted little attention by reason of the isolation of the region, but in 1881 the Old Dominion Co. built a copper furnace, about 6 miles west of town, to work some ore found in schists near the smelter, but this, proving to be a bunch, was soon exhausted. The smelter was then removed and set up at Globe, where for some time it was run on the copper ores of the Old Dominion mine. This ore was too siliceous for profitable operation under existing conditions and the company bought the Globe mine, near town. In May, 1884, nearly 500 tons of copper were produced by two 30-ton stacks. The name Old Dominion was then attached to the copper mine in town and the original Globe was abandoned. The property, notwithstanding its promise, was sold at auction in 1886 for \$130,000. This was due chiefly to the low price of copper, the industry becoming unprofitable under existing conditions. Freight had to be hauled 120 miles from Wilcox, and the heavy expense could not be met with copper at 10 cents per pound. Circumstances compelled the closing of the mines. In 1892 a number of the most important mines of the district were consolidated under the title of the United Globe mines, but the Old Dominion has been and continues to be the most important property in the district. These two companies own the most important mines of the district. The copper ores occur in the southern end of the Globe hills and the silver and gold ores in the northern end of the same range.

The accompanying illustrations give a good idea of the character and topography of the country about Globe. The copper ores of Globe district are both oxidized and sulphide ores. Up to 1901 the oxidized ores proved the most important factor in the copper production of the district. Since then the sulphides have become of increasingly greater importance. This is chiefly chalcocite. Chalcocite also occurs, but, as far as known, not in large amount.

Malachite, the green carbonate, has been a very abundant ore in the Globe district; but azurite, the blue carbonate, is rarely seen there. Chrysocolla, the silicate, occurs in quantities of commercial importance. This ore is much lower in grade than malachite, owing to its large content of silica and water. It is found in many colors from light green through shades of bluish green to dark green and black, the latter color being due to manganese.

The Clifton district is also in southeastern Arizona, near the New Mexican boundary. The principal mines of the district are owned by the New England & Clifton Copper Co. One of the accompanying illustrations is that of a gravity tramway, showing one of the methods of surface transportation employed there.

### New Use for Acetylene.

It is stated by some German papers that a new use for acetylene gas has been found. The latest invention is its use as an explosive. By means of an air mixture explosive force is obtained, it is claimed, which can compete with that of powder and dynamite. The explosion takes place in an air chamber and is caused by an electric spark. For this purpose carbide of calcium is reduced to small particles and put into a tin box. In this the carbide lies at the bottom and above it is a partition filled with water. Above this is a vacant space with the electric percussion device. On the side of the cartridge is an iron pipe by means of which the partition between the carbide and the water can be perforated. After the drill hole has been completed the cartridge is placed in it and the hole is closed with a wooden stopper. Then the protruding iron pin is struck, by which the partition is perforated and the water is caused to come in contact with the carbide, whereby the acetylene gas is generated. This mixes with the air of the drill hole. After five minutes the gas is ignited by an electric spark. By this method of blasting the rock is said to be not thrown out, but rent with innumerable cracks, so that it can be easily removed afterwards.

## Treating Concentrates by Pan Amalgamation at the Minas del Tajo, Mexico.

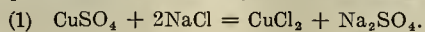
Written for the MINING AND SCIENTIFIC PRESS by  
A. E. DRUCKER.

In a former article published in the MINING AND SCIENTIFIC PRESS some months ago, a description of the pan process as used on Tajo ores was given, also some causes for the "flouring" of quicksilver, and the remedies used for reducing such losses to a minimum. I shall now endeavor to describe a process for working fresh or oxidized concentrates, as used by myself at the Tajo, and probably it may be of some use to others working under the same conditions.

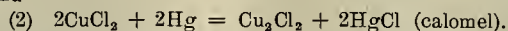
Formerly the concentrates produced at this plant had never been worked successfully in the pans, but were sent to the nearest smelter for treatment. This, however, was a very unsatisfactory method, owing to the excessive transportation charges, smelting rates, and a large amount of mercury lost through smelting—otherwise saved by the pan process. Something had to be done, and so the pan method was tried; it proved to be the best means, not only by saving a greater portion of the values, but also of saving quicksilver which amounted to several flasks a month.

**CHARACTER OF THE CONCENTRATES.**—At this mill concentration took place after amalgamation of the free gold and silver values. The tailings from the settlers were run over the Wilfley tables and the concentrates containing galena, chalcopryites, iron pyrites, zinc blende and "floured" quicksilver saved. The percentage of concentrates with the Tajo ores ranged between 3% and 10%, and the ore at times was very base. More than one-half of the values were contained within the floured quick, and these are the values that are saved mainly by pan amalgamation and not (to any extent) those combined mechanically or chemically with the concentrates. Some of the old concentrates were very rich in floured quicksilver. We had 1000 tons of these oxidized concentrates to work, which had accumulated in former years.

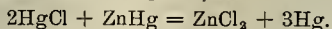
**ZINC AMALGAM AS A MEANS FOR COLLECTING FLOURED MERCURY.**—While experimenting with the concentrates in a small laboratory pan, it was found possible to run floured mercury together by the use of zinc amalgam, salt and bluestone, varying the amount of bluestone according to the conditions of the concentrates (fresh or oxidized). The action of zinc amalgam on floured quicksilver was first discovered by trying a simple experiment. Quicksilver, salt (NaCl), bluestone (CuSO<sub>4</sub>), and water were added to a test tube and agitated, and it was found that the mercury was soon finely subdivided, and that subdivision continued until floured mercury resulted. The globules were coated with a dark gray film of calomel (HgCl), it being formed by the action of cupric chloride on mercury. The reactions are:



and



While the quicksilver was in this condition, a very small piece of zinc amalgam was added and almost instantly the floured mercury joined with the larger particles to form one large bright globule of mercury. Zinc amalgam has the power of dissolving and cutting the calomel film, thus causing the immediate reunion of the finest quicksilver particles.



This property of zinc amalgam was made use of on a large scale, and we immediately set to work experimenting on some old oxidized concentrates. Our apparatus consisted of two iron pans, 5x3 feet, and two settlers, 8x4 feet, having a capacity of eight tons per twenty-four hours. At first our experiments were failures, but through perseverance and many trials, we succeeded in getting all parts of the process adjusted, so that a complete saving of the floured quicksilver was made.

**TREATMENT OF OXIDIZED CONCENTRATES.**—The concentrates originally containing galena (PbS), chalcopryite (CuFeS<sub>2</sub>), iron pyrites (FeS<sub>2</sub>) and zinc blende (ZnS) were badly oxidized, especially the copper and iron pyrites, which make up about 30% of the product. This necessitated a complete change from the ordinary process of working ores, the amount of bluestone, speed of the miller, time of grinding and amalgamating, temperature of charge, speed of settlers and the forms of settler shoes all being changed. It was necessary to use one settler for each pan, instead of two pans to the settler, which was the common practice with ordinary ores. Three hours were required for grinding and amalgamating, while the settler took the same time to work off the former charge of concentrates successfully. At first two hours were consumed in grinding and one for amalgamating, then two hours for grinding and two for amalgamating, and finally one hour grinding and two for amalgamation was found to be the best economic arrangement. The increase in extraction, due to a longer amalgamation than two hours, did not warrant the increased expense of treatment. Practi-

cally all the attainable values were extracted after two hours amalgamating. A somewhat greater extraction was obtained by grinding two hours in the pans, since fine grinding liberated some of the free gold that was mechanically combined with the sulphurets. However, I believe the increase was due to this fact alone, since the extraction increases in proportion to the amount of grinding and fineness. Excessive grinding did not pay, for the time consumed, and the additional expense more than offset the values obtained.

**AMOUNTS OF BLUESTONE, SALT AND ZINC AMALGAM NEEDED.**—Sixty to seventy ounces of bluestone (CuSO<sub>4</sub>), according to the degree of oxidation of the ore, were used on working the oxidized concentrates. The amount of CuSO<sub>4</sub> needed depended upon the color and condition of the quicksilver particles. In the case of oxidized concentrates, when the mercury in the pans becomes yellow, add more (CuSO<sub>4</sub>), or some zinc amalgam to get rid of this yellow coating on the quicksilver. It was absolutely necessary to remove this coating of the mercury if we expected to collect any or all of the "floured" quicksilver. I noticed that when oxidized concentrates were worked and sixty ounces CuSO<sub>4</sub> used, we got a very pure amalgam, the reason being that all the metallic iron particles (from wearing of shoes and dies) within the concentrates were oxidized and could not reduce the copper chlorides to copper, thus filling the amalgam with copper. While in the case of fresh concentrates we got impure amalgam containing copper, due to this reducing action of iron. About five times the amount of bluestone required for ordinary ores (twelve to fourteen ounces) was needed in the working of the concentrates. Our concentrates were made up mainly of galena and zinc blende, being one of the causes for using larger amounts of bluestone, since both of the chlorides of copper decompose these two sulphides.

The regular amounts of salt (NaCl) and mercury, as used with our ordinary ores, were employed in working the concentrates. Twenty pounds of salt and two quarts of mercury were found to be the proper amounts for each one-half ton charge. The bluestone and salt were put into the pan shortly after the concentrates were charged, and the proper amount of water added, the miller being lowered, the charge heated to 80° C., and all ground for one hour. At the end of this time the miller was raised, quicksilver added, and amalgamation continued for two hours. When the amalgamation was completed the charge was drawn into a settler and there worked off gradually for three hours.

Always add the quicksilver through a bag so that it can be finely distributed at once throughout the charge. By doing so it will take less to do the work and better satisfaction is given all around. One-half ton of concentrates was found to be enough to put in the pans at one time, as a better circulation and mixing of the pulp was afforded, thereby causing the quicksilver particles to come in contact with all parts of the charge.

No caustic soda (NaOH) was used in treating the concentrates, for extra precautions were taken to guard against grease getting into the pans. NaOH precipitates a hydrate of copper, Cu(OH)<sub>2</sub>, from the cupric chloride solution (CuCl<sub>2</sub>) which is not desired.

Zinc amalgam was required in different amounts, according to the appearance of the mercury particles during amalgamation. On panning out some of the charge, if the mercury had a yellow coating—film of oxides, probably—more zinc amalgam was required to remove it. As long as this film remained, plenty of floured mercury could be seen with the coated quicksilver particles on panning, but when removed it did not seem to take long in collecting all the floured mercury. This was a very important point and upon it depended the success of the process. All the way from three to eight ounces of zinc amalgam were required to the charge, the amount depending on the degree of oxidation of the concentrates. It was always added with the quicksilver in which it dissolved.

Zinc amalgam is prepared by taking sheet zinc and cleaning with a very dilute solution of sulphuric acid, adding all (zinc and solution) to an iron pot containing a flask of mercury, and heating slowly over a fire. The zinc will readily amalgamate, and the amalgam gathered on top of the mercury can be lifted out and squeezed dry. The operation can be repeated until all the mercury is absorbed or enough amalgam produced, being careful not to let the weak acid solution all evaporate and cause the quicksilver to boil. The solution on top prevents mercury fumes from being formed and also keeps the zinc clean.

**PROPER TEMPERATURE AND THICKNESS FOR THE CHARGE—SPEED OF PAN MILLER.**—The charge was heated at the start to 80° C. with steam from the boilers. At this temperature the chemicals performed their work more satisfactorily and the amalgamation took place rapidly. When the temperature is low, the mercury is less active and amalgamation goes on slowly. High temperatures cause losses in quicksilver and an unsatisfactory amalgamation. It was necessary to use steam heating, since the miller only made sixty-five revolutions per minute, and at that speed it was impossible to bring the temperature up to the required point.

The thickness of the charge is a very important



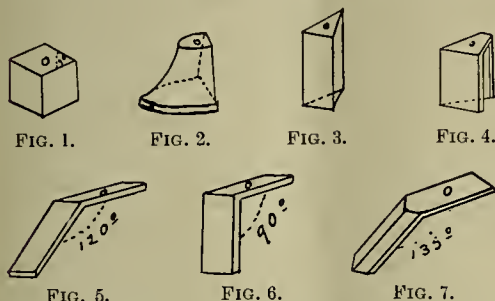
matter. If the charge is too thin the particles of quicksilver will not be kept in suspension, resulting in very poor amalgamation. The charge will also become cold, which should be avoided. On the other hand, if too thick, there will not be a proper circulation of the quicksilver particles throughout the charge. When the proper thickness has been attained, the pulp will just run from a dipper slowly and the mercury particles will be seen coming to the top and circulating all through the pulp.

Sixty-five revolutions per minute was found to be the proper speed for the pan muller while working either fresh or oxidized concentrates, and less than this speed would not cause a proper circulation of the pulp and quicksilver.

It can always be known when a good saving has been made by simply panning a little of the concentrates before discharging. If no floured mercury is seen, then a satisfactory amalgamation has taken place. Generally all the floured quick has disappeared some time before it is proper to discharge the pan. On panning out some of the charge before the quicksilver was added, considerable floured mercury could be seen. We also obtained from working these concentrates several flasks of mercury a month.

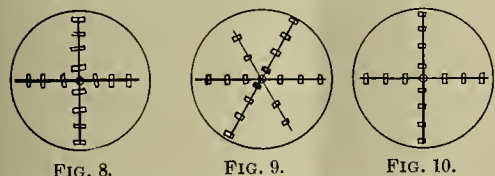
In treating fresh concentrates we were not troubled with the yellow coating on the quicksilver particles during amalgamation, which was the case with old concentrates. They were taken direct from the concentrators as fast as produced and worked in the pans. The only change from the above process was the smaller amount of bluestone used (fifty ounces).

**SETTLERS, BEST ARRANGEMENT AND FORM OF SHOES.**  
—The following forms of shoes were experimented upon with various results: Nos. 1, 2 and 5 were



very unsatisfactory, producing large losses in quicksilver. Forms 2, 5 and 7 have a tendency to keep the mercury particles up and throw out large amounts through the discharge holes of the settler. No. 1 was very suitable for working ordinary ores, but with heavy concentrates the settler could not be kept clean at the bottom, so as to cause a perfect separation between concentrates and quicksilver. The settler should never be allowed to foul by accumulation of heavy concentrates at the bottom. It is a positive preventive of good work and a perfect separation. Nos. 3 and 4 were a slight improvement, but not thoroughly successful. No. 6 was found to be the proper form of shoe, and was finally used in working up all the concentrates. It produced a less loss of quicksilver than any of the other forms, after being adjusted to the proper speed.

The settler must have a certain speed to correspond with the number of shoes used. With four arms to the muller, use fourteen shoes (type 6), arranged as in Fig. 8, having a speed of twelve revolutions per minute.



With six arms, use eighteen shoes (type 6), as shown in Fig. 9, and a speed of ten revolutions. Four arms and ten shoes will need fourteen revolutions. The arrangement as in Fig. 8, twelve revolutions per minute, was found to give good satisfaction. If the concentrates had a tendency to bank up at the center of the settler, it was found helpful to incline the face of the shoes (those next to the center) on the arms, as shown in Fig. 10. The velocity of the water increases gradually from the center towards the outer circumference of the settler. Sulphide particles that would float, and be kept in suspension at the outer circumference, would sink to the bottom of the settler towards or near the cone (center). The inclined shoes push the settled concentrates outward into the stream, where they are obliged to float, thus keeping the settler always clean at the bottom.

There is a certain current velocity at which a perfect separation of the sulphides from the mercury particles is effected. The velocity of the water should be such that the heaviest sulphides will just be kept in suspension, while the particles of mercury of a greater specific gravity are precipitated and collected with the mercury at the bottom of the settler. For good results, mercury should not be allowed to escape through the two upper discharge

holes, and a very slight amount, if any, should escape from the third (lower) plug hole. Panning will detect such losses.

The settler should have a form of cone as in Fig. 11,



FIG. 11.

since the concentrates are not allowed to gather ("bank up") at the center and cause trouble. The form of cone shown in Fig. 12 is not satisfactory. If



FIG. 12.

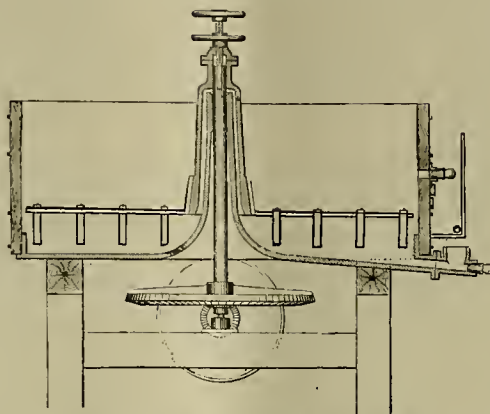


FIG. 13.—SETTLER SHOWING SHOES.

the discharge boxes on the settlers are lined with copper amalgamating sheets, almost all floured quicksilver escaping will be caught on them.

The three hours required for the settler to work off a charge is divided up as follows: After the concentrates have been discharged into the settler and the proper amount of water added, it is allowed to run fifteen minutes before removing the upper (first) discharge plug, causing a settlement of the mercury particles. Then the discharge takes place for forty-five minutes through the first (upper) hole, one hour through the second, and finally one hour discharging from (lowest) third hole. The settler is now plugged up and made ready for the next charge.

Summing up all of our results, we arrived at the following conclusions: That the best possible results were obtained when—

1. Keeping the charge at a temperature of 80° C.
2. Having the charge at a certain consistency so that it will just run from a dipper with difficulty.
3. Having the pan muller revolve at sixty-five revolutions per minute.
4. Working in the pan not more than one-half ton of concentrates at a time.
5. Using sixty to seventy ounces of bluestone with oxidized and fifty ounces or less with fresh concentrates—twenty pounds of salt used in both cases.
6. Always using a small amount of zinc amalgam with the quicksilver and two quarts of mercury with each charge.
7. Adding the quicksilver through a bag.
8. Grinding one hour and amalgamating two.

#### IN THE SETTLERS.—

9. Using the arrangement as shown in Fig. 11 for the settlers, and also inclining the shoes as in Fig. 10 (twelve revolutions per minute for muller).

10. Employing the form of settler shoes as shown in Fig. 6, made of cast iron.

We were able to make a saving of 56% to 70% of the values, (which was better than shipping) all depending upon how rich the concentrates were in floured quicksilver. The concentrates would run all the way from \$45 to \$80 per ton in value. The tailings (concentrates) from the settlers would average from \$19 to \$24 per ton, and were values that could not be saved by pan amalgamation. They were, however, impounded for a possible future cheap method of treatment.

THE Mexican Government has under consideration the proposition to establish a series of ore-treating establishments throughout the country at points remote from railways, and in the neighborhood of low-grade mines, which, through lack of transportation facilities, are at present entirely cut off. These plants are to be operated as intermediary between the miners and the smelting plants. The erection of one of the plants at an isolated mining camp will be equivalent to the introduction of a railroad to the district or to the establishment of a smelter in its vicinity. The matter is under consideration.

## Stamp Mill Capacity.

Written for the MINING AND SCIENTIFIC PRESS.

There is an undoubted tendency to endeavor to increase the duty of the quartz mill by various devices. In any mill of given capacity per stamp this capacity may usually be increased in a variety of ways, if not already at the maximum. The screen may be changed for one of coarser mesh, or the number of drops per minute may be increased, or some other scheme may be tried, such as crushing finer at the breakers. Of the several expedients here suggested the last is undoubtedly the best, but a change from any given screen to one of coarser mesh, while possibly increasing the tonnage passing through daily, may have the effect of producing a coarser pulp, which will not so readily yield up the values. With the tendency to increase capacity of the stamp battery is also the desire to crush finer than has been the practice heretofore. High capacity, with consequent low extraction, is not a condition to be desired. The duty of the stamp mill battery varies greatly, even in the same district. In some districts the main object appears to be capacity, and with it is usually found a higher grade of tailings than is commonly found as a result of gold milling operations. On the Rand, South Africa, it is more common to find the tonnage per stamp to exceed rather than fall below five tons daily. In California the average is probably between three and four tons per stamp, though in some localities in that State it is five tons or more, and at the Gold Hill mine, near Angels, in Calaveras county, at one time as high as seven tons per stamp were put through the battery. This ore consisted of a soft, decomposed greenstone schist, with enough quartz in the form of veinlets to help to give large capacity. Soft ores do not always yield large stamp tonnage, as, for instance, in the Calico silver district, in San Bernardino county, Cal.; the Silver Monument mine and some other mines in Garfield and Odesa canyon produced a soft ore—a rhyolite tuff impregnated with chloride of silver. When this ore was crushed in the stamp batteries alone it required a very large amount of water to secure a daily output of three tons per stamp, but when the brittle, though soft heavy spar ores, or the hard flinty jasperoid ores of the district were fed with the soft tuff, the daily capacity of the stamp at once was raised to more than five tons. The stamps in the Run-over mill weighed 900 to 1000 pounds and dropped 5 inches 110 times per minute. The ore did not require extremely fine crushing, as it was charged to pans where it was subjected to a certain amount of grinding during the process of amalgamation. The screens used were 600 to 900 meshes per square inch. At the Homestake mine, Lead City, S. D., the duty per stamp is about four tons per day, varying somewhat in the ores from the several mines of the group. The mesh of screen is important in the milling of ores, and this should be determined by the extraction of precious metals. Undoubtedly fine crushing renders the small particles of valuable mineral more easy of attack by either quicksilver or solutions introduced for the purpose of dissolving either the gold or silver. A particle of gold enclosed within a grain of quartz will probably be lost, as it is not exposed to the action of quicksilver, or to the dissolving influences of cyanide or other solutions. Neither is it in suitable condition for concentration. With coarse crushing, then, may usually be anticipated high-grade tailings. There is a desire to secure large stamp capacity while at the same time keeping tailings values down. How to accomplish this is a question for the mine superintendent or metallurgist in charge to determine.

Undoubtedly one method of accomplishing this is by crushing the rock finer at the breakers. The smaller the maximum of size as the ore comes from the breaker, the greater the capacity of the stamps within certain limitations. As a rule the rock breakers do not do as much work as should be required of them. In some mills the breakers are only run a few hours each day, and the maximum sizes of pieces of ore going to the batteries are often so large as to be unable to pass the lip of the feed slot at the back of the mortar. If the crusher be set to crush finer the capacity of the mill will at once be increased. If the ore coming to the mill gains upon the breaker man, then a different arrangement must be provided. Breakers set tandem, as suggested above, will increase capacity largely.

Where all the ore from the mine, after being run through a large breaker, which crushes it to pass, say a 3-inch ring, falls on a grizzly which sizes it roughly to 2 inches, the coarse product going to a smaller breaker for finer crushing, it will be found to accomplish a wonderful saving by increased capacity of the stamps. This is a feature of mill practice which many mill men seem slow to recognize. In a 40-stamp mill, where rock of uniform grade was fed to the stamps, several experiments were tried with screens of varying size and different heights of discharge. It was found that a 30-mesh screen, with a



6½-inch discharge, crushed four and one-quarter tons per twenty-four hours. An adjoining mortar, with a 40-screen and 3-inch discharge, crushed as nearly as could be estimated about the same amount of ore, but the tailings were about 10 to 15 cents lower than on the higher discharge battery. This indicated that the ore required the finer crushing to release the gold bound up in the quartz and pyrite. In a case like that cited it is wisdom to adopt the finer screen and low discharge, but in another mill on different ore similar experiments may not produce the same results. Each case should be given the advantage of experiment. The simple fact that each stamp in a mill is crushing four tons per twenty-four hours, and that 42% of the values are being saved, does not prove that by altering the running arrangements of the mill it will be impossible to secure better results by still finer crushing and at the same time keep up or increase capacity. An increase in mill capacity without increase in value of tailings means a lowering cost of milling.

Every mill man who takes the proper interest in his work is desirous of reaching in his mill the maximum of capacity with the minimum of loss, but it should be remembered that a method which is applied successfully with one kind of ore may not give as satisfactory results with another. The mill man is therefore required to experiment until he has reached as near perfection of the economic problem as seems possible under existing conditions.

Often the ore of a mine is of such character that large tonnage per stamp is impossible without heavy losses in the tailings. Some mills do not crush over 1½ to 2 tons per stamp, because the rock, while requiring fine crushing, is very hard and flinty and difficult to amalgamate. In such cases it is, doubtless, economy to reduce the capacity per stamp and save as high a percentage of values as possible. Increase in mill capacity may always be obtained by increasing the number of stamps. It is safe to say that in a large mill ore may be treated at a lower cost per ton than in a small one, for the reason that the ratio of expense per ton is less in a large mill than in a small one. The crew required to run a 5-stamp mill may also run one of ten stamps, and the crew of a 40-stamp mill may usually operate one of sixty stamps. Power generally costs less per unit; fewer men are required per unit; and the original capital expense per unit is less—the unit being either the stamp or the ton of ore crushed.

It has been suggested above that by crushing the ore finer at the breakers the capacity of the stamp battery may be materially increased. This has also been accomplished another way, and that is by conducting the pulp from the battery (which is provided with a coarse screen—60 to 150 meshes per square inch), to a rotary grinding mill, of which there are several types, in which the pulp is ground to the necessary fineness to pass a 900 to 1600 screen, or finer if necessary. This results in largely increased capacity, with somewhat increased expense for plant and power.

Still another method, and one which may be worked in conjunction with the tandem rock breakers, is that of placing a comparatively coarse screen in the battery (400 meshes to the square inch), which will give large initial capacity. It has been proven by many screen tests made in a great many mills, that no matter what the mesh of a screen may be, there is always a large percentage of the ore crushed which will pass a very much finer screen than that in the battery. This fact insures the prompt discharge of the finest material. If this pulp, as it comes from the battery, be run through a fine trommel, or on an impact screen supplied with the proper mesh to produce the desired fineness of pulp, say 1600 to 2500 mesh, the fine sand and slimes will pass through the screen and be taken care of for further treatment by amalgamation or cyanidation, while the oversize is sent, by automatic conveyor, back to the battery for finer crushing. This keeps a certain amount of pulp in circulation, but it results in high battery capacity and all of the ore is reduced to desired fineness with the least loss of time and expense of power. The feeder must be set so that it will not overfeed the stamps, or the battery screen will become clogged. Just to what extent the capacity per stamp may be increased cannot be determined offhand. This can only be ascertained by experiment. With different ores the result will differ more or less as it does in the ordinary methods of crushing. There are other important factors which influence the duty of the stamp mill. These are quantity of water fed in the battery; inclination of the battery screen; the superficial area of screen surface; the height of drop and number of drops of stamp per minute. The weight of stamp varies somewhat with the wearing down of the shoe, but this is in a measure equalized by the increasingly higher drop which results as the shoe wears away. Careful millmen keep the drop as nearly uniform as possible by adjusting tappets.

The introduction of double crushing, as suggested here, in no manner alters the other factors in securing high stamp duty and satisfactory amalgamation, or good results in cyaniding. Slimes are no longer so much to be dreaded by the millman and the cyanide operator. The introduction of proper classifying devices has made it possible to separate the sands from the slimes and to treat each separately.

## The Strength and Life of Mine Timbers.\*

Written by W. H. STORMS.

The problem of the support of underground workings of mines is an ever important one with the miner. In some instances the following data are secured from specific tests of various kinds of timber, where they have been placed in the same shaft, drift or stope, either in the same sets or in alternate sets, with a view to learning from actual experience what timber best met the requirements of the several cases.

These notes apply only to the Pacific coast, where only Pacific coast timbers are used. In other regions the timber, grown under somewhat different conditions, may be either better or worse for the purpose.

On the Pacific coast there are few hardwood trees which are suitable for use as mine timbers. In fact, oak is about the only wood, aside from the numerous conifers, used in these mines. There are a few rare exceptions, which may be mentioned more as matters of interest than of value, where cottonwood, ironwood, juniper, old railroad ties, and even yuccas, are used as mine supports; but these, for the most part, are on the desert, where the choice of timber is determined by environment. For that matter, the same may be said of almost any other locality where timber is available—the miner usually prefers that which is easiest to obtain, and which is the least expensive.

There are on the Pacific coast about sixty varieties of cone-bearing trees. Among these the most important are probably Oregon pine, spruce, yellow pine, sugar pine, pinon pine (bull pine), several varieties of fir and redwood. Perhaps the most commonly used of these several varieties of cone-bearing trees in California is the yellow pine, though all are agreed that the yellow pine is neither the strongest nor most durable. Farther north—in Oregon and Washington—the well known Oregon pine is largely in use, but there, as elsewhere, the matter of choice is determined usually by that which is most accessible and least expensive. Oregon pine is variously called "Douglas fir," "Douglas spruce," "yellow fir" or "red fir," according to its color, and by lumbermen and builders "Oregon pine," "Puget Sound pine," etc., but authorities have centered on "Douglas spruce" as the proper name for this magnificent timber.

Elaborate tests have been made with Pacific coast timbers, with a view to ascertaining their respective values for structural purposes. When the engineer desires to build a bridge, a head frame, or a building, he is enabled to figure on conditions which are nearly constant, but when mine workings are to be supported by timbers he can no longer depend upon constant pressure or strains resulting from the shifting of such weights. The outgrowth of this practice has been to increase the size of timbers in seeking additional factors for safety, until it is not an uncommon thing to see timbers 30 inches in diameter in drifts and stopes. But experience proves that even these great logs are insufficient to withstand the tremendous strains which come upon them, and engineers are arriving at the conclusion that it is more economical, and quite as safe, to use smaller timbers, and, where practicable, to fill the mine excavations with waste contemporaneously with extraction of ore, and that, while this method is more expensive in first cost, it is far superior and less expensive in the ultimate cost per ton of ore removed.

It has been observed many times that where drifts are timbered through very heavy ground the largest sized timbers last but little, if any, longer than those of considerably smaller dimensions. Where this is the case it is certainly less expensive to renew breaking timbers with sticks of moderate size than to have to replace very large ones with others equally large, in about the same length of time. This applies particularly to swelling ground. It has been repeatedly proven that by lagging the sides of a drift in swelling ground in such manner as to admit of cutting away of the material as fast as it forces its way through the open spaces between the lagging, and also relieving the lagging and the posts of the set by cutting out the rock as it is thrust forward, the set may be kept in position much longer than where tight lagging is put in, with a view to holding it back. The pressure is irresistible and cannot be held back—the ground must be relieved, and where this is promptly and properly done the life of the timbers, of whatever kind, will be greatly increased. Since this is the case with side lagging, why not adopt the same method for the back of the drift, and instead of lagging the roof of the drift as solidly as possible—the usual practice—leave broad open spaces between the lagging, that the back may be relieved in the same manner as the sides? Timbering is expensive, not only in first cost, but in framing, handling and putting in position, and in re-enforcing, but particularly in renewing, and any method of timbering which will have a tendency to prolong the life of the timbers will reduce the cost of timbering.

In stopes, as previously stated, it has been shown that smaller timbers will perform the functions de-

manded, or expected, of large ones, if filling is properly and promptly placed. It is a well-known fact that the heaviest timbers, no matter how placed, are an insufficient support to the tremendous crushing force of the hundreds of thousands of tons of rock which sometimes settles upon them, particularly when the weight shifts from one direction to another, as the excavation of large masses of ground proceeds above, below and on either side of a timbered stope. Filling, then, is imperative in a large mine, and as filling cannot be either dispensed with or neglected, smaller timbers will suffice to sustain the weight pending the filling of the excavation. By smaller timbers is meant those having 12 to 18-inch dimensions as compared with those of 24 to 30 inches.

In attempting this substitution of smaller for larger timbers, the method of filling is very important. If a stope 100x150 feet is superficial area, and standing at an angle above 45°, be carried up full size several sets above the floor of a level, and the entire stope, excepting gangways and mill holes, be filled to within two sets of the back, this stope is in great danger of collapse unless the walls be very firm and without a soft gouge, and there is equal danger if the ore body be at all heavy, even though the stope be timbered throughout with square sets. There are cases, of course, where this may be done, and done with impunity, but there are many more places where there would be grave danger in attempting it, and this danger is greatly increased in the case of ore bodies which grow narrower upward.

Hewn timber and peeled round timber are undoubtedly superior to the square sawn timbers, but hewn timbers are rarely used except for shaft work, where sawn timbers are not readily obtainable. The hewn timbers are stronger and less liable to split under stress than the sawn timbers. Timbers may be hewn with such exactness as to make them rival the sawn timbers, if care be taken. The finest job of hewn timbers for mine purposes I have ever seen is in a shaft on the Mount Pleasant mine, near Grizzly Flat, El Dorado county, Cal. There a two-compartment shaft has been timbered to a depth of 265 feet with hewn timbers about 12 or 14 inches square. The shaft has perfect alignment and the framing and facing of the timbers has been done with such care that at first glance I thought sawn timbers had been planed before placing them in position in the mine.

Round timbers are used to a great extent throughout California mines, except in shaft work, where square timbers are usually employed, and in most of the large modern shafts, either Oregon or Puget sound timber, the so-called "Oregon pine" is used. It is no uncommon thing, however, to see in the older shafts on the Mother Lode, round timbers hewn flat on two sides. This practice, however, has mostly disappeared.

As already stated, the kind of timber found in mines is that variety usually the most easily obtainable, and generally this is the least expensive also—at least in first cost. As to the strength of the timbers, less attention is, perhaps, given this, it being the aim of the mine superintendent to employ such timber as in his judgment will meet his requirements, and there is a predilection in favor of timbers of liberal size.

Even more important than the first cost of timbers and the placing of them in position in the mine, is the life of the timbers, for it is more expensive to remove old timbers and replace them with new, than the first cost, consequently it is desirable to have them last as long as possible.

There are many conditions which have an important influence on the life of timbers when placed underground in mine workings. Among those influences which are most noticeable are the condition of the mine atmosphere; its humidity and temperature; the absence or presence of water (not merely dampness or an occasional drip). All miners are aware that any kind of timber under water will last almost indefinitely; while that which is alternately wet and dry decays rapidly. A warm, moist atmosphere is more destructive of timber than a cool, dry one, for that matter. Heat has a particularly bad effect on timbers of any kind when placed underground.

The condition of the timber when it goes into the mine is very important. A thoroughly seasoned timber will outlast a green one or one but half seasoned, unless placed under a constant stream of water. Timber should be examined in the yard, and those sticks selected which show a firm, solid growth, whether the rings which represent the annual growth of the tree be close or some distance apart. Often, where the grain is coarse, the space between the rings is soft and spongy, and may be readily picked out. This timber will not endure, and should be used where filling will soon relieve it of weight. Timbers well seasoned, and with a firm, solid growth, will last best, and may be used in shafts, stations, drifts and other permanent openings.

The season of the year when timber is cut is important. That cut in winter is firmer and harder than that cut in the spring and summer months when the sap is up. It is also a fact that timber grown on the hillsides facing the south is superior to that grown on the north slopes, probably due to the fact that the north slopes are more moist, and the growth of timber more rapid, and consequently softer and less enduring.

(TO BE CONTINUED.)

\*Abstract Trans. Cal. Min. Assn.



## Formation of Ore Bodies on Intersections.\*

Written by MARK B. KERR.

Practical miners and mine owners generally are rather more interested in the commercial value of ore bodies than the form of the deposit or the possible cause of origin of the gold.

Gradually and surely, however, the physiography of a special region and the geology of the vein fissures coursing through it are being studied with more interest and precision. The intelligent direction of mine exploration must be based upon scientific and mathematical lines, else such development must necessarily become random and fortuitous. In many failures of the past had the geology been better understood, the elements of chance in the explorations would have been much lessened.

Recently many papers by eminent chemists and economic geologists have appeared in the proceedings of the American Institute of Mining Engineers by Posepny, Lindgren, Weed, Gillette and others on "Replacement," or changes in ore-bearing fissures and the rock contiguous thereto. New classifications and terms have been introduced to more systematically explain these matters, and metasomatic forms in ore-bearing fissure veins appear to be the theme of the present.

How were these changes effected? Was a given opening filled from below by solutions from ascending waters, or were these solutions, either hot or cold, spread laterally, thus filling the opening fissures and adjacent territory?

And further, after arguments have been made upon the merits of these theories, another question arises: What force or forces would be required to send up these waters, and if downwards, what energy would cause the surrounding cavities to be filled?

Thus another term of Greek origin is coined and "Osmosis," or the forcing of one chemical solution through another is now used to represent this pushing force.

Mine owners often say "what is the use of this contention and what difference does it make, anyway, which one of the theories is correct, we are interested more in the fact whether or not that certain deposit will pay a profit." Whilst without doubt, the commercial aspect is the most important consideration, still if the mine owner can once be made to see that without theory, the facts will never be discovered, he will soon realize that it is "money" to him to follow out development on scientific lines, and save the expense of misdirected exploration.

For the past ten years the writer has studied closely the gold-bearing veins of the Pacific slope, both in flat granite fissures as well as in the steeper slate veins of the Mother Lode, and has seen no reason to change the first opinion formed by him that the ascending waters carrying gold in solution were responsible for most of the gold deposition, and oxidation of the solutions by surface waters caused the richer depositions near the grass roots.

In this practical work, one particular feature was noted, viz.: that where intersections occurred, whether on separate veins or on joint or fracture planes, the ore body was larger and richer than elsewhere. This is not strange, for the most insoluble portions of a solution must be deposited where the flow is the freest and cooling most rapid, just as in a bend of a river, the largest deposits and greatest width of sediment and gravel will accumulate at the intersection of the courses of the stream. So, in following up the crevices or fracture planes in an ore body, the moment an intersection at the apex of the seams, or a cavity in a corresponding trough, is encountered, the ore body is enlarged, and what is more to the point, almost invariably enriched.

Consequently a rule can be put down, when the values in an ore body pinch in their strike, viz.: follow along a fracture plane until another parallel intersection is found, and this is likely to lead into "pay" again.

These joint and fracture planes are more readily discerned in the granite than in the slate veins, but can be readily found in the latter if looked for carefully. It is my opinion that gold has been deposited more on the trend and dip of the fracture planes in fissure veins, than on the trend and dip of the main formation. Following out this theory, we can mathematically project the general direction of an ore body and thus save a great deal of useless deadwork in those portions of the vein of grade too low in value to pay for mining and milling. In other words, the dip and strike of a pay shoot in my opinion (or the "rake" as it is sometimes called) can be obtained and projected with mathematical exactness, when the strike and dip of the transverse fracturing has been discovered. Too much attention has been paid by geologists, in my judgment, to general form and classification of ore bodies and not enough to exactness in strike and dip of the intersecting veins forming the mass.

It is my intention to bring before the members of the Miners' Association two instances, under my personal supervision, of the facts proving the theory, by practical illustration.

## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

G. A. Singer, superintendent of the Olympic mines at Woodsky, expects to resume work.—The Leland Dredging Co. is building a dredger to operate on Solomon river, in the Bonanza mining district, Seward peninsula.—At the Humboldt mine in Silver Bow basin, near Juneau, ten stamps are dropping.

A. H. Brooks, geologist in charge of the division of Alaskan Mineral Resources of the United States Geological Survey, plans work in Seward Peninsula, the Yukon-Tanana region, Prince William Sound, Matanuska and Controller Bay coal field, the Yakutat Bay coal field, and southeastern Alaska for season 1905. F. H. Moffit and P. L. Hess will study the Nome region, which was topographically surveyed last year by T. G. Gerdine. Special attention will be given to the high bench gravels, and an effort will be made to determine the old topography which they represent. They will also make further study of the tin deposits near York. The Solomon River region is to be mapped by T. G. Gerdine and assistants. D. C. Witherspoon will continue the topographic survey of Yukon-Tanana region, beginning at Circle on the Yukon and proceeding west toward Fort Hamlin. L. M. Prindle will proceed from Dawson westward to Fairbanks on the Tanana to map the areal geology and to study the placer deposits. U. S. Grant, of Northwestern University, will study the copper deposits about Prince William Sound and make stratigraphic studies along the shore line of the Sound. S. Paige, geologic aid, will make a geological reconnaissance of the Herendeen Bay coal field in Alaska Peninsula. An accurate topographic map on the scale of 1 mile to the inch will be made of the entire coal region about Controller Bay and of the area within which there is indication of petroleum. G. C. Martin, A. G. Maddren, E. G. Hamilton and W. R. Hill will do the work. R. S. Tarr will make a reconnaissance survey of the Yakutat Bay region. It is desired that he should determine whether the coals reported to occur in this district belong to the same horizon as do those of high grade found in the Controller Bay region, 100 miles to the west. F. E. Wright and C. W. Wright will continue to map the general geology and to study the ore deposits in southeastern Alaska, including the study of the gold and copper deposits of Admiralty island.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The report of the Calumet & Arizona at Bisbee shows that the company produced during 1904, 15,819 tons of refined copper. The production in gold was \$195,926.18, averaging \$12.38 per ton of refined copper. The average price received for refined copper was 12½ cents. Dividends paid out amount to \$1,300,000.

Bisbee, April 11.

Superintendent Whitson of the Quincy-Bisbee M. & D. Co., 5 miles north of Naco, intends to commence sinking a three-compartment shaft.

W. F. Staunton, superintendent of the Tombstone Con. mines, at Tombstone, says water has been drained out to the 800-foot level, and crosscuts are now being run on that level. At 700 feet the ground was equally as wet as it was at the 800-foot level, but now it is dry. They are going deeper, and draining the basin as they go. They are raising 3,150,000 gallons of water per day, and he expects to place an additional pump on the eighth level, which will facilitate operations. In the Silver Thread shaft a fine ore body has been opened up 100 feet below the former water level, and ore is being shipped regularly.

#### Gila County.

(Special Correspondence).—The Globe & Arizona Dev. Co. has started development work on three claims near Globe. The Great Eastern shaft is down 85 feet.

Globe, April 11.

It is reported that a St. Louis, Mo., company has been formed to work the Keystone, near Globe, with J. C. Erman as superintendent and J. R. Finletter as general manager.—Superintendent J. B. Coplen of the Inspiration M. Co., near Globe, reports that the Woodson tunnel is in 680 feet.—T. G. Cockrill, president of the Pinto Creek M. & S. Co.; G. Watkins secretary, and J. W. Castle treasurer, all of St. Joe, Mo., recently examined the company's property on Pinto creek, near Globe.—The 350-foot level of the Yo Tamhien mine has high-grade ore. The lower crosscut tunnel, which Superintendent Fuller is driving with power drills, is in 730 feet.

#### Graham County.

(Special Correspondence).—The strike at the Copper Creek mine, near Klondike, via Wilcox, in a recent test at the El Paso Smelting Works, gave high returns. The company has completed a road for ore hauling and has put in a double-cylinder gasoline hoist, and they will put in an air compressor and machine drills. T. Gill has charge of work. The ores will be treated in El Paso until the company can build a 100-ton smelter.

Klondike, April 10.

(Special Correspondence).—The output of copper for March was low, because of washouts on the Coronado railroad carrying ore from the mines of the Arizona Copper Co. and the Shannon mines to the smelters in Clifton. The A. C. Co. produced in March 1228 tons and the Shannon Co. 480 tons of copper.—The Irish M. Co. has cut a 7-foot vein of good copper ore in its tunnel on the east side of Chase creek, near Clifton.—The Coronado Copper M. Co. is developing its properties near Metcalf.—The New England & Clifton Copper Co. will commence shipping ore as soon as their hines are completed.—The last shipment of ore made to El Paso,

Tex., by Superintendent R. Lakeman from his mine on Gold gulch netted \$178 per ton.

Clifton, April 11.

(Special Correspondence).—The Shannon Copper Co. at Clifton is setting up a new 250 H. P. engine to give additional power to run the two furnaces continuously. The development of the mine has increased its output to the point where it can supply two furnaces.

Clifton, April 11.

A good strike has been made in the Irish Co.'s mines on the east side of Chase creek, near Clifton, by Geo. Truesdell.

#### Maricopa County.

(Special Correspondence).—In the Wickenburg section several properties are rapidly approaching the productive stage. The property of the Oro Grande M. Co., 4½ miles north of Wickenburg, has been opened up by 6000 feet of development. The main shaft is down 340 feet. The company's 10-stamp mill, which has a capacity of fifty tons a day, is steadily at work. The ore here is free milling.—At the White Gold M. Co. excavating is completed for the new 20-stamp mill, which is being hauled in from Congress Junction. The bad weather has delayed the erection of the mill sixty days. An additional twenty stamps will be added. This property is 12 miles northeast of Wickenburg on the Hassayampa river. The development consists of 2000 feet.

Wickenburg, April 11.

#### Mohave County.

The 10-stamp mill of the Blue Ridge G. M. Co. in the San Francisco district, east of Vivian, has 1050-pound stamps with 6-inch drop, 110 to the minute. The mortars are set on concrete foundations, placed on bedrock. The mine is opened 150 feet, with sump of 20 feet, from which the water for the mill is pumped. At the 150 level the ledge has been drifted upon for 180 feet. W. Fellows is superintendent of the mine and mill.—The German-American Co. at Acme will put in a 10-stamp mill and 30-ton cyanide plant at the Treadwell mine and build a 75-ton ore bin and 40-foot gallow frame.—A new hoist, gallow frame and ore bin have been ordered for the 35th Parallel mine.

A crosscut from the bottom of the 175 level of the Vanderbilt mine, at Cerbat, has entered a 4-foot vein of good ore. The property is being worked by the Cerbat Mountain M. Co., R. C. Walker superintendent.

The Chloride G. M. Co., working the Samoan mine at Chlor de, has shipped to the Selby Smelting Works at San Francisco, Cal., five carloads of ore. L. Hoffman is superintendent.

#### Yavapai County.

(Special Correspondence).—Good copper ore is reported in the properties of the Wisconsin & Arizona M. Co. in the Turkey Creek district.—The Bannie mine, in the Walker district, has been sold to Linsey, Evans & Ingalls of New York City. Sinking has been started on a 400-foot shaft. A reduction plant will be built on the property.—The Pine Mountain claims, near Walker, have been purchased by E. F. Bacon of Detroit, Mich. He also has acquired a group of four claims near the Sun Dance mines on the Hassayampa, on which work is to begin within a few weeks.—The miners at Jerome in convention have refused to join the boiler makers' strike instituted in the United Verde. So the general walk-out that was predicted will not take place. The recent accident at that mine was thought likely to add further to the miners' grievance, but it has not done so, they evidently appreciating that the accident was not the fault of the management.

Prescott, April 11.

E. S. Campbell, general manager of the Richinbar M. Co. at Richinbar, is preparing to start up the 10-stamp mill at the mine and to increase its capacity.—F. Barr, of the Thumb Butte M. Co., west of Prescott, has completed retimbering a tunnel, which was caved by floods.—G. U. Young is building a quartz mill in the Thumb Butte section.—The foundation for the new Val Verde smelter has been started.—It is reported that H. M. Merriweather of Kansas City will start work on the Geo. Zika properties, near Richinbar. E. S. Campbell has charge.—H. W. Campbell, H. Miller and O. F. Bacon of Chicago and Detroit, have purchased the Pine Mountain mine and 10-stamp mill, near Walker, and will work the property. The main shaft is down 400 feet.

Superintendent Tharsig of the Lincoln gold mine, near Crown King, intends to have the concentrators in and the mill running by May 1.

J. Larson has commenced work on the property of the Venture Hill M. Co. near Jerome.

It is reported that the Rincon M. Co., near Martinez, will put in a new hoisting plant with a capacity of 2000 feet. A milling and cyanide plant have been ordered and will be built by T. Stewart. The work is being done mostly on the Dixie ledge. G. D. E. Mortimer is superintendent.—D. J. Sayer of the Sayer G. M. Co., which has taken over the Churchill group, near Martinez, is expected to arrive from Denver, Colo., to continue work. The shaft is down 420 feet.

#### Yuma County.

At Columbia mining camp Wm. Bear is sinking a 100-foot shaft.—The Eureka at Columbia, belonging to J. W. Lind, is preparing to ship ore to the smelter.

## CALIFORNIA.

#### Butte County.

Platinum has been found near Chico, Magalia and Oroville, that near Chico having a value of \$5.46 per ton of concentrated sands and worth 8 cents for each dollar in gold. E. W. Abbey of Honcut is preparing to prospect gravel deposits between Oroville and Honcut that he has bonded. Dredgers will be built if the ground be rich enough.

#### Calaveras County.

The Melones Co., at Robinson's Ferry, will add forty more stamps to their mill and will have 100 stamps dropping inside of three months. A new air compressor is to be put in. The company is shipping twenty-five carloads of sulphurets per month to Selby Smelting Works.—The new tramway of the Utica Co., at Angels, ex-



tending to the railroad station, has been started.—The Fortuna M. Co. has purchased the Paul Lane mine at Altaville.—The 10-stamp mill on D. Roller's mine at Carson has started operation.—Work has been resumed at the Eazy Bird quartz mine near Mokelumne Hill, under the superintendency of W. T. Robinson.

#### El Dorado County.

It is reported that the ledge of the Rio Vista copper mine, near Fairplay, has been cut 400 feet below the surface. F. H. Harvey is general manager. The company will drift north and south on the ledge and make arrangements for a smelter.—Work has been started on the Rebel Hill mine, near Georgetown, to put it in shape to be hydraulicked.—The 2-stamp mill at the Hanson mine, near Georgetown, has been started and work is being pushed on the mine.

#### Kern County.

At the Yellow Aster mine at Randsburg a new motor engine has been put in to be used instead of the mules for hauling ore cars to the mill. It is a double ender of 15 H. P. capacity, weighs 6200 pounds, and is capable of hauling 30 cars. A third rail will be laid for the present and the same cars used as now.

#### Nevada County.

H. Kaler has resumed work at the Lindsay mine, near Maybert.

It is reported that a 10-stamp mill will be put in at the Chicago mine, near Grass Valley. A double shift is driving south on a new ledge.—The Murchie mine, near Nevada City, is to have a new 10-stamp mill with 1400-pound stamps.—The Morning Star mine at Badger Hill, near Nevada City, is being worked by Philip Deidesheimer. The shaft is down 50 feet and a hoisting plant is to be put in.

It is reported that the Polar Star mine, near Grass Valley, will resume operations. J. W. Neil is manager. The owners of the Scott's Flat gravel diggings on Deer creek, 7 miles above Nevada City, are planning to sink a shaft for the blue gravel channel that is supposed to underlie that section of country in its course from Blue Tent to Hunt's Hill and Red Dog. They expect to have to sink 400 feet.

#### Placer County.

H. T. Power, superintendent of the Hidden Treasure mine, at Bullion, reports that the 10-inch bore hole is down 100 feet. The shaft is 210 feet deep and the upraise 310 feet. When the boring is finished it will let the water out of the shaft into the tunnel, and the bore will then be enlarged to the size of the shaft. The tunnel is now about 2 miles long.—It is reported that the Buckeye mine, near Forest Hill, has shut down.

#### Plumas County.

The Tabor mine, near Gibsonville, is working with thirteen men pushing the main drift. The indications are favorable for breaking into the channel. C. D. Acker is manager.—A. W. Whitney has sold his mining property on Rush creek, formerly known as the Providence Hill mine, to the Rush Creek G. M. Co., who will put it in order. The dam at the head of Rush creek will be completed.—In the Nelson mine, near Willow Ranch, the company is running a bedrock tunnel. The managers of the work are Wilson and Tyler.—G. Maurer has a crew raising the breast of the restraining dam at the Bell mine, Elizabethtown. The mining property is under bond of sale to a Seattle syndicate, and under superintendence of H. K. Kling.—The Gibsonville M. & Dev. Co. is working at the Union mine, near Gibsonville, under the management of G. W. Lambert.

#### Shasta County.

In the Sunny Hill mining district, near Ono, the Marina Marsicano M. Co., L. F. Barlow manager, is putting in a concentrating plant and a 1400-foot aerial tramway. The new 5-stamp mill is nearly completed. The company intends to put in a cyanide plant.

#### Siskiyou County.

J. Beatbam, manager of the Lappin mine, Deadwood, has purchased an air compressor for the mine.—W. F. Klein is working his claim on Eddy's gulch, near Sawyer's Bar.—The Bill Burns claim, near Sawyer's Bar, under the supervision of G. A. Mohr, is keeping a crew employed.

#### Sonoma County.

The African Gold Reef M. Co. of Petaluma is working 14 miles from Santa Rosa and 1½ mile east from Beltaine. J. Henderson is president and S. A. Fancher secretary and treasurer, at Petaluma.

#### Trinity County.

C. M. Butler and Geo. Grotenfend of Redding have leased the Altoona quicksilver mine, at Cinnabar, and will begin prospecting. A Swedish company has leased the dump and is ready to start the smelter at the mine. The plant has a twenty-five-ton capacity.—At the Brown Bear mine, at Deadwood, the mill is crushing ore for sixteen leasers.—At the Lappin mine, at Deadwood, the air compressor has been put in and the lower tunnel is being driven in. When the connection is made, the force will be increased.—At the Frick & Davis mine on Donnelly gulch, near Deadwood, J. H. Covode, the owner, is putting in machinery to sink on the ledge.

#### Tulare County.

(Special Correspondence).—W. G. Anderson is putting in heavier hoisting machinery preparatory to sinking the shaft on the Redfield mine at White River to a greater depth. The mine is on Bald mountain, 2 miles from White River; the vein is 4 feet wide with granite walls, formerly known as the Last Chance mine. White River, April 10.

#### Tuolumne County.

The Clio mine, near Jacksonville, has been bonded to H. Malmgren of Los Angeles, Cal., for \$55,000.—J. Charters of Tuolumne has secured a six months' working bond on the Hope mine, near Columbia.—The Davis claim near Sugar Pine has been bonded to Los Angeles, Cal., people and it is said that a 5-stamp mill

will be put up. Allen has charge.—The shaft of the New Tonopah, near Columbia, is down 110 feet.—The shaft at the Hardtimes at Arrastraville is down 150 feet and will be continued until the 180-foot mark has been passed. W. P. Cunningham, president of the Bluebell M. Co., has been at the mine.—Superintendent R. B. Stanford of the Ranch mine, near Columbia, reports a large crew of men employed, the mill running steadily and the gravel high grade.

### COLORADO.

(Special Correspondence).—J. H. Richards of Boise, Idaho, president of the American Mining Congress, delivered an address before the Chamber of Commerce in Denver on the American Mining Congress, its aims and needs. He urged upon the people of this State and city the need of a suitable building where the congress could have its headquarters and its members could be made to feel at home. The building would also be used for the display of a large mineral exhibit.—The report that the students of the School of Mines at Golden, Colo., are contemplating a revolt against the management on account of the suggested addition of a secondary course for the benefit of mine and mill foremen does not seem to be well founded. Dr. Alderson, president of the school, has been censured for allowing his name to appear in a prospectus "Mining as a Business." It is not anticipated that the outcome will be serious. A movement is on foot to have the president investigated by the board of trustees on account of his alleged association with a mining company.

Denver, April 11.

#### Clear Creek County.

The Saratoga vein has been cut in the breast of the Newhouse tunnel at Idaho Springs 15,156 feet from the portal. The pitch of the vein and its course and position are as expected by the engineers. The character of the ore is identical with that found in the west level of the Saratoga. The Saratoga group consists of nineteen patented mining claims, covering an area of seventy-five acres, and 1 mile of the Saratoga vein. There is 47,000 feet of underground workings, two-thirds of which is now under water, and will be drained through the Newhouse tunnel. Three shafts are sunk on the vein, No. 1 being 400 feet; No. 2, 1000 feet; and No. 3, 600 feet in depth. Each shaft has a complete equipment of machinery and all are connected by levels. The vein in different parts of the mine is from 6 to 20 feet in width. The Saratoga group is held under bond and lease by C. Morgan and J. Owen of Idaho Springs, who will make connections with the mine workings, and as fast as the water lowers in the Saratoga shaft men will be put to work getting the mine in shape for production. Surveys show that the heading of the Newhouse tunnel is 265 feet below the bottom of the Saratoga shaft, and a level driven east 525 feet and an upraise of 365 feet will make connection with the ninth level 1525 feet west of the Saratoga shaft. The tenth level west from the Saratoga shaft has been extended but 720 feet, and it would require over 100 feet farther of driving and an upraise of 265 feet to make connection with that level from the Newhouse tunnel level. The Newhouse tunnel was located by S. Newhouse on February 13, 1901, the preliminary surveys being made in the spring of that year. But little work was done until the fall of 1903, and in the following January a power plant was installed at the tunnel mouth and it has since been driven with machine drills. For two and one-half years the tunnel was driven 9 feet in height and 10 feet in width, with double tracks laid with 35-pound rails, 18 inch gauge. In the center underneath the tracks is a waterway 14 inches deep and 2 feet in width, over which is laid a 19-inch exhaust ventilating pipe. The size of the tunnel was reduced to 6 feet in width and 7½ feet in height when the work was resumed the last time, with one track, this being deemed of sufficient size until the traffic through the tunnel would warrant its being widened. The maximum vertical depth attained by the tunnel is 1780 feet, equivalent to 2200 feet on the prevailing dip of the vein. The tunnel is owned principally by Englishmen, the corporation being known as the Newhouse Tunnel Co. of London, the Colorado corporation being known as the Argo Mining, Drainage, Transportation & Tunnel Co. The projected terminal of the tunnel is under Quartz hill, which will be reached in about 7000 feet of driving. The tunnel, including equipment, has cost to date \$400,000. The breaking cost has been about \$19.67 per foot for the double track section and less for the single track portion. The grade of the tunnel is 5 inches per 100 feet.

#### Custer County.

(Special Correspondence).—The foundation for the 300-ton cyanide plant between Silver Cliff and West Cliff is nearly completed and the lumber for the building proper has commenced to arrive. It will probably be six months before this mill is in operation. C. M. Fueller of Denver has the contract for building the mill. Silver Cliff, April 9.

The Hector mine, in the Hardscrabble district, near Custer, has started up. This property has been idle for some time on account of contending interests.

#### Dolores County.

The Durango Leasing Co. has resumed operations on the Enterprise mine, near Rico, with twenty men. T. Rockwood is manager. J. S. Krantz is in charge of the mine and C. W. Blackburn of Cortez is in charge of the mill.

#### Gilpin County.

During March the shipments of smelting and crude ores, mill tailings and concentrates from the Black Hawk depot to the Denver and Golden smelters amounted to 359 cars, or 7525 tons, which shows an increase of 60% over the corresponding month for 1904.—G. L. Baughman of Rollinsville has bought an interest in the Happy Hollow claims between Rollinsville and Gambell gulch. Surface work has been commenced to open up the vein, after which sinking will be started.—The Jumbo Mountain M. Co. on Jumbo mountain, on Jenny Lind gulch, near Boulder Park, have driven a crosscut tunnel 300 feet through Jumbo mountain to cut their veins.

A. E. Simpson is superintendent.—The Colorado and the C. & H. claims, on the east side of Gambell gulch, have been leased and bonded to F. Augustus of Rollinsville and L. Sarchalett of Perigo.—Sinking has been stopped at the After Supper mine of the Banzai M. Co. at Black Hawk, reports Superintendent A. Watters. A lift of 110 feet has been sunk, bringing the shaft down to a depth of 250 feet. Drifts have been started off on both sides of the shaft at a depth of 240 feet. L. R. Tatum of Denver is president and manager.

#### Gunnison County.

The Buckeye Chief and Bonanza Queen mines, near Pitkin, operated by Linn, Langill and Smith, have a tunnel in 200 feet. A winze is being sunk from the tunnel level, 120 feet from the portal, and is down 40 feet. The pay ore is being sacked for shipment.—A vein of good milling ore 18 inches wide has been struck in the Gold Links tunnel, at Pitkin, 1190 feet from the entrance. J. F. Pearson is superintendent.—The Golden Islet M. & M. Co. has leased the Jersey Blue mill on Ohio creek, near Pitkin, to treat the low-grade ore from the Cortland.—The management of the Chloride mine, at Pitkin, expects to unwater the lower levels.

#### Hinsdale County.

L. Kafka has contracted with J. A. Hunt and C. A. Weirs to build a new dam at the Hidden Treasure mine near Lake City.—W. J. Gardner of Paterson, N. J., and B. N. Ramsey have been examining the U. P. claims in Alpine gulch, near Lake City.

#### Lake County.

At Leadville the main drift from the Murphy shaft is in 60 feet.—At the Dome prospecting is still carried on from the bottom of the shaft, but as yet the ore channel has not been found.—Work has been started on the Sullivan shaft and the Lucky Joe shaft.—At the Nil Desperandum the new water column has been completed and raising water has been commenced. When the bottom of the shaft is reached the balance—15 feet—will be sunk, and then the drift to the south to catch the ore bodies will be started.—The Parson claim on lower Rock hill is now known as the Algot Mining & Investment Co. of London, England. J. Walsh is sinking the shaft the first 1000 feet.—The old shaft on the Myrtle claim, Iowa gulch, Leadville, has been cleaned out by D. Vaughn to a depth of 75 feet. A new plant of machinery is being put in and when this is completed the shaft will be sunk to a depth of 400 feet.

#### Ouray County.

It is reported that the Security G. M. Co. of Cow creek, near Ouray, will build a 40-stamp mill near the mouth of Cobb gulch.

#### Park County.

G. W. Chance of Philadelphia has purchased the Copper Verde claims in the Copper Gold district.

#### San Juan County.

The San Juan S. & R. Co. at Silverton expects to start up its smelter on June 1. The smelter, in addition to treating the ores of the Henrietta and Lizzie mines, belonging to the company, will buy custom ores.

#### San Miguel County.

The Japan Mines Co., at Telluride, have been driving an upraise from the tunnel level to connect with the upper workings of the Japan, which are filled to a depth of 250 feet with water, which, with the breaking through of the upraise, will be drained by the 500-foot shaft into the tunnel level, thence out 3000 feet into Savage creek. Engineer Comstock estimates that the old workings carry 3,000,000 gallons of water. To prevent accident a small drill hole has been kept 15 feet ahead of the blasts, so that there will be no mistake in breaking through and releasing this volume of water.

It is reported the Alta mine and mill at Telluride has resumed work after a short shut-down due to the breaking of the bullwheel on the tramway.—A. C. Kirby mill foreman of the 80-stamp Liberty Bell mill above Telluride, has started thirty of the stamps. The mill has been idle since last December, and in that time an entirely new process has been put in for the treatment of the ore, and the interior of the mill has been rebuilt.

#### Summit County.

The hull of the gold dredging boat of the Reliance Gold Dredging Co. is ready for the machinery, which has been shipped from New Jersey. The boat is in the French gulch, 1 mile from Breckenridge.—The Mekka Gold Mines Co., in which the Lennox gold mines syndicate of Colorado Springs is interested, will resume driving the bedrock drain sluice near Breckenridge, as soon as the weather permits, and will also work its rich ground with hydraulic elevator and "giants" during the entire season.

#### Teller County.

(Special Correspondence).—J. M. Jordan, secretary El Paso Con. G. M. Co., says that there have been no new developments in the drainage tunnel for Cripple Creek. If the Portland G. M. Co. does not subscribe largely it is likely that the Elktion will start and drive the present tunnel into their own (Elktion) ground. The El Paso has started sinking their shaft to the 1000-foot level, and, if the new tunnel goes through, they will sink to the 1400-foot or the new tunnel level. If the new tunnel does not go through, the El Paso will put in their big pumps, which they have on hand and have never used, and pump the water from the 1000-foot level. Cripple Creek, April 10.

The new shaft on the Mary Nevin, in the gulch between Beacon and Rosebud hills, Cripple Creek, is down 205 feet and will be continued for another lift of 100 feet under a contract issued by C. G. Jackson. A No. 5 pump and a 4-drill compressor have been put in. When the 300-foot point is reached, a lateral will be driven 155 feet north, where it is calculated an extension of the C. K. & N. vein will be encountered.—On the Black Jack lode of the Anchor Co., south of the Mary Nevin, the shaft is down 150 feet.—In the Fountain Valley claim of the Banner G. M. Co., Crowder and associates, lessees, are crosscutting at a depth of 330 feet, where sinking was recently suspended.—The 200-foot level has been



reached in the Rocky Mountain lode, below the El Paso Con., by H. L. Shepherd and associates, lessees, who intend to crosscut east into Beacon hill.

The Jefferson claim, on Battle mountain, Cripple Creek, has been leased to W. H. Camp of Colorado Springs, who will commence operations at the 500-foot bottom level and work north towards the Strong mine.

The Fortuna G. M. Co. has been formed by C. S. King, president; L. Mueller, vice-president, and C. A. Jacobs, secretary-treasurer, to work property near Battle mountain, Cripple Creek. The property consists of a shaft 500 feet deep, with a fine plant of machinery. L. Mueller has charge.—The J. A. Logan compressor is running to supply air to lessees of the Orpha May, at Cripple Creek.

## IDAHO.

### Boise County.

G. Z. Edwards, superintendent of the Lincoln M. Co., near Pearl, will contract for structural materials for the new cyanide plant. The new shaft is down 300 feet and will be continued until down 800 feet. The concentrator has been hung up indefinitely. The mill of the Kentucky Co., near Pearl, is crushing ore. The ores of this district are granular altered granitic gangue and quartz impregnated with lead and zinc sulphides; the gold values in milling ores range from \$5 to \$15 per ton, 25% free milling.

C. C. Gilliland of St. Louis, Mo., agent of the American Exploration Co., which owns the Nellie claims at Horseshoe Bend, and E. Nelson of Vermont, Ill., and C. W. Samuels of Clinton, Ill., have been examining the property and as a result Manager M. E. Hopkins has let a contract to drive the lower tunnel, which is in 100 feet, until it taps the vein. The property is to be equipped with electric power for drills. Tests are to be made on the ore preparatory to putting in a 100-ton cyanide plant.

### Custer County.

At Loon creek, near Custer, the Lost Packer Co. is completing 7 miles of the Jordan creek and Loon creek wagon road and grading and building the 100-ton smelter under the management of J. A. Czizek.

### Elmore County.

W. Oebs, president of the Gold Eagle M. Co., owning the Gold Eagle mine, in the Neal district, 35 miles from Boise, reports that the company is operating its 50-ton Chilean mill.

### Idaho County.

Jos. Coverly, superintendent of the Elk City M. & M. Co., says that the company will put in a 50-ton cyaniding plant this spring. The development so far has been by one tunnel and a number of open cuts. The main ledge is 8 feet wide.—The American Eagle near Elk City has arranged to resume work.

On Grouse creek, near Resort, the Gott M. Co. plans to make an 11-mile canal to carry the waters of Secesh creek to their gravel beds. They have four giants ready to use. The company will employ 100 men. J. J. Toler is interested.—Near Secesh, W. Allen and C. Wain have a 300-foot tunnel on their property on the south side of War Eagle mountain.

The Buster claims, 1/2 mile from Elk City, belong to S. W. Smith of San Francisco, Cal. The lower drift has been driven 500 feet on the vein and crosscuts will be driven. The ore is reported high grade.

### Kootenai County.

(Special Correspondence).—The Big Blackfoot M. Co., a branch of the Amalgamated Copper Co., is preparing to build a mill at Sandpoint.

Sandpoint, April 10.

### Shoshone County.

T. L. Greenough and P. Larson, owners of the Morning mine at Wallace, have filed an amended tunnel location of the long tunnel they are driving on their property, as it is to bear to the right on a 5° curve. When completed, the total length is to be 10,000 feet, of which 6000 feet have been finished. It is 8 feet high and 7 feet wide in the clear. It is being driven "for the development of the Morning, Evening and other lode mining claims, and for the discovery of other veins, lodes and mines in course thereof. This is the second longest tunnel in the Cœur d'Alenes, the Kellogg tunnel of the Bunker Hill & Sullivan, which is over 2 miles in length, being the longest.

The Oom Paul M. Co. near Wallace will resume work which has been stopped since November, and will put in a small electric hoist. The drift from the crosscut tunnel of the North Franklin near Mullan is in 148 feet. Machine drills are to be put in.—The Springfield Copper M. Co. is running a 1400-foot crosscut tunnel in the Stevens Peak district near Wallace. Walter Graham is president and E. Zeitfuchs, secretary and treasurer.—The Rex, or Sixteen-to-One, at Nine Mile is employing men in the mine and mill. The mine is equipped with an electrically operated 8-drill compressor, a Finlayson tramway, 6000 feet long, between the mine and the mill and a 300-ton concentrator. The mill operated by water power and is on the Nine Mile branch of the Northern Pacific railroad. The principal work in the mine this summer will be done around the No. 2 level which was run partly as a crosscut and later as a drift. It was in 1800 feet before the ore body was struck. J. P. Keane is superintendent.

## KENTUCKY.

A report of the U. S. Geological Survey on the lead, zinc and fluorspar deposits of western Kentucky states that it is separate from the Mississippi valley fields and differs from them chiefly in the presence of basic igneous dikes, in the abundance of fluorite and its almost constant association with the lead and zinc ores, and in the mode of occurrence of the ores, which are found principally in true fissure veins which have resulted from fracturing and subsequent faulting. In the other districts the lead and zinc are of primary importance, while in this region the igneous dikes and the fluorite are the primary or predominant features and the lead and zinc are only incidental. The minerals forming the ore deposits and associated with them in this district are

galena, cerussite, pyromorphite, sulphur, sphalerite, smithsonite, hydrozincite, calamine, greenockite, chalcopryite, malachite, fluorite, barite, calcite, quartz, kaolinite and ankerite. In addition to these, small quantities of some of the hydrocarbon compounds are occasionally found in the veins. Of all these minerals, only fluorite, barite, galena, sphalerite and smithsonite are known to be of economic importance within the district. The ore deposits thus far developed are somewhat unevenly distributed through Crittenden, Livingston and Caldwell counties. At the present time, as in the past history of mining in this region, the mines of Crittenden county include not only the largest producers in the district, but the largest number of productive veins as well. The successful development of the district is primarily dependent on the fluorite, as in the majority of the veins the lead and zinc ores can be considered only as by-products, and in many cases perhaps as mere impurities in the fluorite. Most of the mines are as yet in the oxidized zone, and much of the ore from this belt must be cleaned before shipping. With depth, however, the veins will become better defined and the ores cleaner. Further development along the veins now mined will undoubtedly be advantageous. Better transportation and shipping facilities will help to increase the output of the district.

## MISSOURI.

### Jasper County.

(Special Correspondence).—The Smith-Kernohan Co., of Cleveland, Ohio, has purchased a ten-acre mining tract at Prosperity. One shaft has been sunk 205 feet, and a run of sheet ore has opened up. The new company will build a large mill.—A large pump and other machinery are being put in at the Homestake mine at Granby. Work at the Homestake has been idle since Christmas, but will be reopened as soon as the mine is drained.—A. Wilson, of Joplin, has opened up a lead prospect 4 miles east of Joplin, making 15,000 pounds of lead per week; he is making arrangements to build a mill.—The Progress M. Co. have struck good ore at a depth of 200 feet on their lease on the Colclasure land, 5 miles east of Joplin. As soon as sufficient development work has been done the company will build a modern mill.—G. H. Glade, of Joplin, who has a lease on forty acres of mineral land near Spring City, is developing the tract; 1000 feet of drilling will be done this spring.—The J. A. C. M. Co., of Joplin, operating on the Robertson land, 3 miles southeast of Joplin, is preparing to sink two shafts on the land, because of rich showing made by drilling.—Gundling & Tobias, of Joplin, have a new mill on the Leonard land in the Chitwood district.—Ball, Gunning & Co., of Webb City, has let a contract for a concentrating mill on their lease on the Reliance M. Co.'s tract at Neck City.

Joplin, April 9.

## MONTANA.

### Fergus County.

J. L. Stuart of Lewistown reports a strike of high-grade galena 2 miles from Maiden.

### Flathead County.

J. M. Wolfe and party of Seattle, Wash., have been at Libby testing the placer ground owned by the Cherry Creek Placer M. Co. on Cherry creek, to ascertain what the ground will produce, and if satisfactory, they will put in a hydraulic plant.

The July mine, near Troy, is working two shifts. The steam hoist put in is in active use and the management will continue sinking indefinitely. The Big 8 mine, near Troy, which has been leased to Spokane people, is expected to start operations with an 8-drill compressor and mill.

### Madison County.

Preparations are being made by the Watseca Co., at Rochester, to resume operations on the tailings of the new mill.—Jones & Co. are taking out good ore from the New mine, near Rochester, which they are working under lease.—White and Thomas are shipping two carloads monthly from the Watseca to Helena.—It is reported that the Strawberry mill, near Pony, will be increased by ten more stamps, making it a 20-stamp mill. The ten stamps are crushing ore from the Clipper mine on Mineral hill.—Work is being rushed on the 20-stamp mill of the Garnet G. M. Co., at Pony. The ditch is being freed from snow and ice, and as soon as the water can be brought around to the mill it will be started.—Geo. Lennstrend and F. L. Buck have struck free milling gold near Pony adjoining the Atlantic and Pacific property, and may have a mill in operation on the property by July.

### Missoula County.

H. T. Wilkinson of Missoula contracted with O. Erickson to run a tunnel 50 feet farther in the Cape Nome claim, near Clinton. The tunnel on the Cape Nome claim is 658 feet long.

### Silver Bow County.

(Special Correspondence).—It is probable that the North Butte M. Co. will take over the Speculator, Jesse and other mines of the Speculator M. Co. of Butte. T. F. Cole of Duluth, Minn., is president.—The managers of the Pittsburgh & Montana Co., who built in Butte a new process smelter which has never worked successfully, claim that part of their processes have been adopted by F. A. Heinze at the smelter of the Montana Ore Purchasing Co., where they are in successful use. In this method the natural fuels which the ores themselves contain are utilized in extracting values through heat produced by the converting process, in lieu of water concentration, heap roasting, calcination or the use of coke or carbonaceous fuel of any kind. The Pittsburgh management claims that its smelter is completed and ready for a run, but that owing to the water in the workings of the mine no ore can be produced. The mine has been flooded for five months. It is understood that one of the new electric pumps has also proved a failure through a mistake made in the construction of the motor and electrical conductor.—The Butte Copper & Zinc Co., controlled by the same New York men who are at the head of the Montana Zinc Co., which is experimenting with a new process for treating the zinciferous

ores of the Alice mine, in Walkerville, has bought the Emma mine, at Butte, from C. E. Dickerman of Minneapolis, Minn. The Emma has carried only zinc and silver, and too much zinc to make it profitable for mining for silver, as the local smelters can not treat zinc ores. It is believed that with greater depth, the shaft now being down 900 feet, the Emma will develop into a copper property, as several of the copper veins to the north dip under the Emma claim.—A new reverberatory furnace is being built in the smelter of the Montana Ore Purchasing Co. and the capacity of the company's concentrator at Basin will also be increased from 1200 to 2000 tons. The new furnace at the smelter will be much larger than any of the others in the plant. The plant is now treating from 1200 to 1500 tons a day. Only one of the four blast furnaces in the smelter is now in operation and is consuming 150 tons a day.

Butte, April 10.

The principle of the ore treatment at the Montana Ore Purchasing Co.'s plant depends, first, upon the production of a lower grade matte from the blast furnace, giving an increased capacity, reduced coke and flux consumption and a consequent reduced slag loss and an increased capacity in the calcining furnaces. The steel converter shells are lined with magnesite brick, next to which is placed a lining of siliceous ore. The converter is then charged with 1000 pounds of siliceous ores in lump form, which is cemented to the bottom and sides of the converter by a small charge of low grade molten matte. A full charge of low grade molten matte is then introduced and the blast turned on after the converter is placed in an upright position. The heat thus produced by the converting action dissolves the ore charge, and thereafter the iron in the matte, after oxidation, dissolves the ore lining. The mineral values contained in each are thus separated from the gangue of the ore and join the bath of molten matte, forming an alloy of copper and precious metals, while the waste materials form silicate of iron, or slag, which, being less in specific gravity than matte or metals, floats to the surface of the bath and is removed. The converting action is continued until the grade of white metal has been reached, and it is thereafter continued until the remaining sulphur, arsenic, etc., have been expelled by oxidation and the resultant bath is thereafter poured, in the form of clean blistered copper, into plates, slabs or bars for shipment to establishments in the East, where electrolytic separation of the precious metals is accomplished.

## NEVADA.

### Elko County.

The Carlson mine and mill at Mardis, near Wells, are being put into shape to resume work this month.

### Esmeralda County.

The Montgomery Shoshone M. Co. has been formed to work the Montgomery-Edwards property at Bullfrog. E. A. Montgomery is president and manager, M. MacDonald vice-president and consulting engineer and J. C. Connors of Idaho Springs secretary and treasurer.—The new camp of Sumo is 7 miles northeast of San Antonio P. O., 10 miles north of Liberty, and 32 miles north of Tonopah, via the Belmont road.

Ore shipments via the Tonopah Railroad for the week ending April 7 were as follows: Tonopah, 871 tons; Montana Tonopah, 206; Tonopah Extension, 225; Tonopah Belmont, 80; Midway, 62; Combination, 60; Goldfield Sampling Ore Co., 248.

Work has been started on the Hart-Goldfield M. Co.'s property near Diamondfield by M. F. Kirkpatrick.

### Lincoln County.

J. C. Kavanaugh will sink a 100-foot shaft on the claims in the Crescent district, which is north of the Searchlight district, and near Los Vegas.—It is reported that a 10-stamp mill will be put in at the Nipino in the same district.

It is reported that the Empire Con. M. & M. Co., near Searchlight, intends to put in a 40-stamp mill. E. B. Scott is manager.

### Lyon County.

E. Boyle, manager of the North Rapidan M. Co., at Como, has started work at the mine. It is reported that a large reduction plant is to be put in.

### White Pine County.

At the Star mines at Cherry Creek the shaft is down 800 feet, and will go on down to the 900-foot level. This mine is being worked by the Glasgow & Western Exploration Co., of which D. M. Boyd of Salt Lake City is secretary.

## NEW MEXICO.

### Doña Ana County.

The Cahallo mountain gold placers, above Rincon, on the Rio Grande river, are being worked by J. H. and M. B. Parker, who are putting in a 9000-foot pipe line.

### Grant County.

Companies working in the Chiricahua mining district, 10 miles northwest of Rodeo, are the Chiricahua Development Co., near Paradise, the Savage Gold & Copper Co., 5 miles east of Paradise, and the Cochise Consolidated Co., 2 miles north of Paradise, who have fifty men employed and expect to put in a 50-ton concentrating plant. J. A. Lewandowski is manager of the Savage Co.

### Otero County.

The Southwest S. & R. Co. has made plans for a 400-ton smelter at Jarilla. The company controls 600 acres of mining claims at Jarilla and is leasing the ground.—The Kansas City Co. has men on the Ruby and Monte Cristo claims at Jarilla and has commenced shipment of ore to the El Paso smelter.

## OREGON.

### Baker County.

A strike of free-milling ore is reported from the Homestake group, near Bourne, belonging to A. E. Dagany, who wishes to put in a 500-foot hoist.—The Midway group, 7 miles from Sumpter, is putting in a 6-drill compressor for deeper sinking. Sinking was suspended at



the property last year owing to the difficulty of continuing with hand drills. The shaft is down to the 200 level, with stations at the 100 and 200. Drifting and sinking are to be continued at the same time.—A strike is reported on the Snow Creek mine, near Greenhorn, in the second crosscut from the 200 level leading from the main shaft. D. P. Smith is manager.—The tunnel being driven through the hill at the Vinson placers, on the north fork of the John Day river, near Granite, has been completed. The bottom is being prepared for carrying water through to the placer ground below, and it is expected to have sluicing operations commence in two weeks.—Bids have been called for driving the main crosscut on the Gold Coin group, near Bourne, Cracker Creek district.—W. Stinson reports satisfactory operations on the Lucy group, near Greenhorn. A crosscut has been run 900 feet, at which point the ledge was tapped. This has been drifted upon in both directions for 150 feet.

The new electric pump at the Baisley-Elkhorn, near Baker City, lifts 500 gallons a minute, and has cleared the mine so that work has been resumed on the main working shaft. The hoist is electric; the mine, inside and out, is lighted by electricity, the power for operating the air drills is electric and everything about the mill is operated by electricity.

#### Grant County.

The New York syndicate owning the drift placer ground on Big creek, near Susanville, is getting ready for drifting and hydraulicking. Water is early.

Development at the Monumental mine, near Granite, is progressing steadily. Manager C. J. Allen of Portland has two power drills on the level 100 feet below the main adit. Arrangements are being made to sink the other shaft 100 feet and explore the same ore body 200 feet below the adit. He says that he is using not to exceed 1½ cord of wood a day to make the compressor supply two drills and also run the hoist and pump.

F. W. Burbridge has the hull of the Crane Flat dredger, near Granite, nearly completed.

#### Jackson County.

D. B. Grant, who is developing the discovery near Panther Butte, 4 miles southwest of Ashland, reports that the tunnel is in 150 feet on the ledge.

#### Josephine County.

Manager J. F. Hopkins of the Calumet & Oregon M. Co., near Kerby, will commence work on the crosscut tunnel that is to open the vein system at the junction of the Illinois river and Rancheria creek.

T. F. Hopkins has started work for the Calumet & Oregon M. Co. on the Golden Eagle group, 11 miles from Selma, on the Illinois river.—B. Healy of San Francisco, Cal., owner of the Jewett mine, on Mt. Baldy, 4 miles southeast of Grants Pass, is expected to put in a cyanide plant at the mine. J. S. Hoar has charge at the mine.

D. L. Smith of the Rand M. Co., operating on Rogue river, at Galice, reports that the main drift is in 600 feet.

F. Clemens intends to open the Yellow Horn 3-stamp mill near Leland.

#### Wallowa County.

Good silver ore has been struck in the Great Northern G. & C. M. Co.'s property on the Wallowa slope of the Eagle range, 20 miles from Joseph. E. T. Schuler is president of the company.

### SOUTH DAKOTA.

#### Lawrence County.

The Gilt Edge-Maid M. Co. has started up its mill, east of Deadwood, under new management, and some improvements have been made in the manner of hoisting the ore and in the mill treatment.—The Minnesota Mines Co. of Minneapolis has struck good ore bodies on a property adjoining the Penobscot, in the Maitland district. They intend putting up a mill.—The Puritan M. Co. is installing plates at its mill, south of Deadwood.—The Clover Leaf M. Co. has started up ten stamps at the mill at Rouhaix and intends to treat ore which has been stored. The company will keep this part of the mill going during the season. The reorganization of the company is soon to be effected, which will increase the capitalization. The company is planning to enlarge the mill and further develop its large ore bodies.

#### Pennington County.

(Special Correspondence).—The shaft house of the Clara Belle M. Co. at Oreville was destroyed by fire on March 28th. The hoisting engine was badly damaged, but the boiler was not much injured. Every effort is being made to keep the pumps going, as this is the wet season. It is expected to rebuild at once.

Oreville, April 10.

### UTAH.

The coal deposits of Utah extend from the eastern Utah boundary near Grand Junction, in a southwesterly direction for nearly 200 miles into Arizona. From that point it can be traced north to Fish Creek on the west line of Carbon county. This coal crops out along the east side of Castle Valley from Castle Gate to Grand Junction and on the west side of Castle Valley, from Fish Creek to Emery and down the Muddy creek into Wayne county. There are four veins of coal from 4 to 30 feet in thickness, the vein lying almost flat, dipping to the northwest about 2°.

#### Salt Lake County.

Superintendent F. B. Whitmore of the Columbus Con. of Alta is reducing eighty tons of ore.

Manager Orem of the Red Wing M. Co., at Bingham, reports that the 3000-foot tunnel being driven to cut the vein is in 800 feet. An air compressor and machine drills are to be put in to expedite work.—D. C. Jackling has started work on the old tunnel which starts on the Utah Copper Co.'s ground above the Rogers mill at Bingham. This will be cleaned out and extended into the Ohio Co.'s ground.—F. B. Cook of the Cluster Co., at Bingham, reports that the tunnel being driven to a connection with old workings on the opposite side of the hill is in 1200 feet, and it is calculated that 20 feet more will take

it to the old shaft.—Work has been resumed on the Conger group, adjoining the Starless, at Bingham. The 500-foot tunnel is to be extended and a chute to deliver the waste rock is being huilt over the Copper Belt track.

—It is reported that the U. S. M. Co. at Bingham will add three lead-blast furnaces to the present battery, making six, having a capacity of 800 tons daily.

At the South Columbus mine at Alta they will put in another machine drill and lay a new pipe line. During March one shift in the tunnel made 65 feet, at a cost of \$15 per foot. The tunnel is in 915 feet.

It is announced that the Lark vein of the Dalton & Lark property at Bingham has been cut by the Mascot tunnel 8000 feet from its mouth and at a depth of 1500 feet. The vein shows a large body of high-grade galena.

#### Utah County.

Operating mines in the American Fork canyon are the Wyoming, by G. Tyng; Healy, by the American Fork M. Co.; Whirlwind, by the Whirlwind M. & M. Co.; Blue Rock, by the Pacific G. M. & M. Co.; Bog and Dutchman mines, by the Dutchman M. Co.; Clipper and Silver King mines, by the Clipper & Silver King Con. M. Co.

J. H. Wooton of American Fork expects to start work in the Hot Stuff mine in American Fork canyon, which is owned by the Goodsell M. Co.—C. D. Hanks of American Fork is operating the Shamrock prospect on the Millar hill in American Fork canyon.—Work has been resumed at the Blue Rock mine, in American Fork canyon.

L. Western and Webb Bros. will run a 150-foot tunnel to tap the galena vein of the Cedar Stump, near the mouth of American Fork canyon.

#### Weber County.

D. Maguire of Ogden reports that development work at the properties of the Santa Maria Co. in the Sierra Madre mountains, north of Ogden, is progressing. Adjoining the Santa Maria, Wm. Hunt and associates are running a tunnel to open the vein.

### WASHINGTON.

#### Ferry County.

The Mineral Hill T. & M. Co. has been formed with a capitalization of \$1,500,000, with A. Vittum, Beverly, Mass., president; S. A. Boone, Boone, Iowa, vice-president; D. H. Whipple, Boston, Mass., secretary and treasurer; F. E. Houghton, Boston, Mass., general manager; A. L. Bradley, Spokane, auditor. The manager at the mines is S. L. Boyer. The properties are in the Curlew mining district, on the line of the Spokane & Northern and the Kettle Valley Railroad, 1 mile south of Danville. The company intends to drive a tunnel to intersect ledges on Mineral hill at a depth varying from 600 to 1800 feet. A fee will be charged for all ore passing through the tunnel, the price being regulated according to the value of the ore. A charge will also be made for drainage.

#### Okanogan County.

E. C. Waters of Columbus, Ohio, and J. Rausch of Marysville, Ohio, are at Chesaw inspecting the properties of the Interstate M. Co. They intend to put in a compressor and machine drills at the Delate and Keystone and will increase the concentrator from ten to sixty tons daily capacity.

#### Snohomish County.

W. J. Walters of Portland, manager of the Smuggler Gold and Copper M. Co. at Index, reports that the tunnel is in 165 feet. The company intends to run the tunnel 400 feet, when it will crosscut.

#### Stevens County.

The Blue Bell Gold & Copper M. Co.'s claims on Sofia mountain, 15 miles west of Northport on Sheep creek, has been worked all winter under Superintendent Fred. Friedland. The 400-foot tunnel being run to tap the ledge at a depth of 700 feet is in 300 feet.—The Chewelah Marble Co.'s property on Deep creek, 5 miles east of Northport, is ready to be worked by Superintendent Hanke.

Manager D. F. Strobeck has commenced work on the Independence-Keystone M. Co.'s property, 6 miles north-east of Chewelah. A tunnel will be run in on the ledge to tap the main ore shoot.

### WYOMING.

#### Uintah County.

A. J. Parshall of the U. S. Geological Survey confirms the report of the discovery of rich gold deposits near Kendall.

### FOREIGN.

#### BRITISH COLUMBIA.

#### Boundary District.

The Winnipeg shaft, in Wellington camp, has been unwatered to the 400-foot level.—The new shaft of the Emma mine, at Summit, is down 75 feet.—A. Anderson has given an option on the Jack Pot, at Wellington, to local parties.

The Boundary output for March was: Granby mines, 55,798; Mother Lode, 13,504; Brooklyn-Stemwinder, 10,474; Rawhide, 7933; Mountain Rose, 846; Emma, 885; Oro Denoro, 325; Elkhorn, 60; Skylark, 125; Last Chance, 27; E. P. U., 20; Miscellaneous, 50. Monthly totals, 90,047 tons. The Great Northern railway, which was built to Phoenix camp last year, began hauling ores for the Granby Co. about the middle of February, and the output over this line of railway alone is about 1000 tons daily, while the C. P. R. handles the balance. Part of the three months last past there have been ten blast furnaces in operation in the Boundary smelters, six at the Granby, two at the B. C. Copper and two at the Montreal & Boston. During part of the winter there was a shortage of electric power, which is brought 22 miles from the falls of the Kettle river at Cascade. Negotiations are pending for the erection of a smelter at Midway, where such works could be served by both the Canadian Pacific railway and the Great Northern. An option has been given on a portion of the Midway townsite and on the Sullivan ranch near by for this pur-

pose. Preliminary surveys for the new smelter have also been made. As the B. C. Copper people are about ready to make extensive improvements to their smelting plant, there is a belief that the new site is for them.

A. D. McPhee, superintendent of the McKinley mine, Franklin camp, has started work with ten men.

#### Nelson District.

The Hall M. & S. Co. at Nelson has closed down its lead stack for want of ore. At the trail smelter—the single operating lead stack out of three available ones—will close down for want of silver-lead ore. The trouble is reported to have arisen from the Slocan miners over-estimating their probable output when it was agreed to let the St. Eugene ship abroad. The St. Eugene agreed to supply the difference required to keep the home smelters busy, but although it has each month sent more than half of the ore supplied to Trail and Nelson, the other silver-lead mines have failed to output anything like the amount originally estimated. The St. Eugene during March milled and shipped 3700 tons of concentrates. Of the concentrates made, 2300 tons were shipped to Germany, 80 to Belgium and the remaining 600 tons were sent to the Nelson and Trail smelters.

#### Rossland District.

The Le Roi No. 2 has under contemplation \$50,000 worth of development work, including the deepening of the shaft to the 1450-foot level, which would be 550 feet below the present lowest workings. The Center Star is extending its workings down below the ninth level. The Le Roi is extending the winze from the 1450-foot level down to the 1550-foot level, and the era of deeper mining has begun.—The shipments for the week ending April 8th were: Le Roi, 2800 tons; Center Star, 2050; War Eagle, 1410; Le Roi No. 2, 50; Le Roi No. 2 milled, 1200; Spitzee, 180. Total for the week, 7690, and for the year, 96,904.

#### Slocan District.

J. McKenzie has purchased five-eighths interest in the Gold Bug and Copper Cent. on Cariboo creek, in Upper Duncan district, from W. Williams for \$2000.—It is reported that the Jackson mill and mine at Whitewater will start up April 15. Both have been closed down for some years. At the mine a little work has been going on in the way of leasing or contract, since the company operation ceased, and a good strike of ore was made by the workers last year.—Reports have come out that a rich shoot of ore has been struck on the Fisher Maiden at Silverton. Some time ago a raise was started at a point 300 feet from the portal of No. 4 tunnel. Some rich ore which was met looked so promising that a drift was started to ascertain its extent. This has been run over 50 feet and the ore continues.

### MEXICO.

The following constitute the reforms desired, by the mining men of Mexico, a number of which have been passed as laws: The suppression of the 2% coinage tax on the value of silver, established by the decree of March 27, 1897, and its reduction to 1% in the case of gold. Reduction to cost of the duties on separating, assaying, reducing and refining, and the application of those duties exclusively to hars of metal presented to the mints for those operations. Reduction of the 3% stamp tax on the value of gold and silver to 1%. Reduction of the 2% State tax on the value of gold and silver to 1½%. Monthly fixing, by the finance department, of the price of silver, copper and lead, which is to serve as basis for the collection of Federal and State taxes, this price to be founded on the average quotation of those metals on the New York market during the preceding month. Reduction by 10% of the assay estimate in the collection of the duties on ores that are to be shipped from one State to another or exported from the republic. This must be done by deducting from the weight of the ore that of the moisture which it contains. Reduction, from \$10 to \$5 per pertenenca, of the tax on gold, silver and platinum mine titles, as established by the law of June 6, 1892. Reduction, from \$10 to \$5 per pertenenca, of the annual property tax on gold, silver and platinum mines as established by the previously mentioned law. Exemption from import duties for the articles here enumerated—sulphuric acid, mercury, sulphur, coal and coke, alkaline cyanides, hyposulphates, mine timber, nitrates of potash and soda, sulphate of copper, sheet zinc for metallurgy, and machinery and apparatus for mines and metallurgical establishments. Adequate protection, by the executive, of ore treating establishments, which, employing new processes, such as cyanidation, are erected for the treatment of low-grade ores or of dump accumulations from old mines.

A new mining law was passed on March 25th in the City of Mexico, to take effect July 1, by which the value of the special stamps in conformity with the laws in force, which should be affixed to titles to mining properties, will be \$5 for each pertenenca applied for—no matter what the mineral substance may be. The annual tax on mining properties shall be regulated in the following terms: (a) There shall be paid \$6 annually for each mining pertenenca, or \$2 for each third annual payment—no matter what the mineral substance may be. (b) In case the number of pertenenencias in one mining enterprise shall exceed twenty-five, and these pertenenencias all join one with the other, the price of \$6 shall apply solely for the first twenty-five pertenenencias, and there shall be paid \$3 for each pertenenca which exceeds twenty-five. Denouncements for mining pertenenencias shall not produce any legal effect whatever if the same is not accompanied with a certificate issued by the local stamp office, which certificate shall certify that there has been deposited in the aforementioned office the cost of the title in accordance with the number of pertenenencias contained in the denouncement. This certificate of deposit shall be returned to the interested parties as soon as the stamps paid for are cancelled on the title or the denouncement shall have been finally dismissed.

#### Chihuahua.

The Hidalgo M. Co. have encountered a new body of pay ore in the croppings of the Veta Colorada, next to the hanging wall side of their former operations on the



**Alfarcena, near Parral.**—The Cigarrero M. Co. is completing arrangements for a cable tram from their mine to the railroad station at Baca.

The Parral M. Co. have closed down their concentrating plant at Parral for repairs.—The three-compartment shaft of the El Faro mine of the San Nicholas Co. at Parral is down 150 feet.

#### Jalisco.

An experimental plant has been built to treat the milling ores of the Santo Domingo and other mines of the Amparo M. Co., near Ahualulco. If successful, a 100-ton plant is to be put in at the foot of the mountain in which the company's mines are located and to transport the ores 1½ mile from the mines by an aerial tramway. It is proposed to make the shaft a three-compartment and to put in a hoist. F. Sustersic is manager.

#### Mexico.

The Compania Minera Las Dos Estrellas at El Oro is adding forty stamps to their present 80-stamp mill and cyanide plant. H. Bessaut is manager.

#### Sonora.

Work is to be resumed on the Morene mine, 16 miles from Nacozari, by A. J. Borie.—The Transvaal M. Co., near Cumpas, in the Mictetuzuma district, is putting in a reduction plant. They have some 500 men working. O. L. Neer is manager.

#### Tepe.

T. E. Smith will build a cyanide plant at La Yosca for the Zapopan G. M. Co.—W. Warren, owner of Los Saltos property, near Barranca del Oro, proposes to put in an impact water wheel to give power for working his mine.

#### PERU.

J. D. McKenzie, who has been constructing the 1000-ton smelter at Cerro del Pasco, reports that everything is to be handled automatically by electric power, for which they have a 4000 H. P. plant. All the buildings are of steel. The smelter site is 14,000 feet above sea level, while the mines are 1000 feet higher, a 7-mile railroad conveying the ore from the mine to the smelter where it is automatically dumped into the ore bins. They employ 6000 men, of which seventy-five are Americans and Englishmen and the balance Peruvians. The principal mine is developed to a depth of 400 feet. A. H. Kennedy has charge of the construction of the smelter.

## Books Received.

"Year Book and Views of the Michigan College of Mines," Houghton, Mich., F. M. McNair president.

"Report of the State Bureau of Mines of Colorado for 1903-4," by E. L. White, gives an account of accidents and legislation affecting the mining industry of the State, together with a summary of mineral production.

"Preliminary Report on the Geology and Water Resources of Central Oregon," by Israel C. Russell, is the result of a reconnaissance to investigate artesian water supply, but in addition gives an interesting account of the physiography and geology of this little known region. It forms bulletin 252 of the United States Geological Survey.

"Development of Lake Superior Copper Mines During 1904," by A. L. Carnahan, gives a concise statement of operations at each of the mines for the past year. It states that on January 1, 1905, the Tamarack No. 3 vertical shaft was down 5066 feet and the Calumet shaft down 8100 feet on the incline, being the two deepest shafts in the world.

The recent work of the United States Geological Survey in studying water supply and irrigation is embodied in a number of reports including "Underground Waters of Washington," by H. Landes; "The Disposal of Strawboard and Oil Well Wastes," by R. L. Sackett and I. Bowman; "Hydrography of the Susquehanna River Drainage Basin," by J. C. Hoyt and R. H. Anderson, and "Pollution of Lake Champlain," by M. O. Leighton.

Truly the miner and prospector is a nomad, and like his Arabic predecessor he leaves but slight record of his wanderings. Hence it is with considerable interest that one reads "In the Footsteps of Pizarro," by W. C. Agle. This gives a detail of the experiences of a Yankee miner in the placers of Peru, "the Klondike of South America." It tells of no great enterprises, but is simply a record of daily experiences in an uphill fight against adverse conditions. Its chief value lies in its minute portrayal of a country and people surrounded with natural advantages that they seem to lack the energy to develop. It will prove interesting reading to prospectors or others wishing a knowledge of modern Peru. It is published by H. M. Hall, Seattle, Washington, for \$1.50 and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

"A Treatise on Concrete, Plain and Reinforced," by F. W. Taylor and S. E. Thompson, forms the latest addition to the recent literature on this important subject. It has been designed for practicing engineers and contractors, and also as a text and reference book on concrete for engineering students. The work seems authoritative and accurate and contains information on every branch of the subject, arranged particularly for convenience of reference. The simple directions for concreting will be easily understood by any contractor, while the elaborate calculations and formulas for reinforced concrete will interest the civil engineer. The one volume gathers together material that has been widely scattered and presents it in readable form. It is published by John Wiley & Sons of New York City for \$5, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Personal.

J. MOORE is superintendent Aztec Co., Needlton, Colo.

IRA A. CAMMETT is in Denver, Colo., from Los Angeles, Cal.

H. P. SAUNDERS has returned to Salt Lake City from Denver, Colo.

ROBERT CLARK, of Kalgeerlie, West Australia, is in Denver, Colo.

W. G. YOUNG is superintendent Gold Reef mine, near Kendall, Mont.

M. B. KERR, San Francisco, is experting a mine near Placerville, Cal.

GEO. HILL is superintendent Shenandoah mine, near Silverton, Colo.

W. T. COPE has returned to Grants Pass, Or., from an Eastern trip.

J. W. NEILL has returned from San Francisco, Cal., to Butte, Montana.

F. J. SPARL is manager Pompeii mine, 3½ miles north of Searchlight, Nev.

W. B. STEWART is superintendent Continental mine, near Myrtle Creek, Or.

M. R. LAMB of San Francisco, Cal., is sampling a gravel mine, near Leland, Or.

R. CHRISTENSON has succeeded J. Oates as foreman Bunker Hill, near Amador City, Cal.

JOHN FREISE is manager Goldfield-Scorpion Co.'s properties at Goldfield and Lida, Nev.

J. B. TOMLINSON of Prescott, Ariz., is at his mine in the Bacoachi district, Sonora, Mexico.

ED. PRINTZ, Bishop Creek, Inyo county, Cal., is at Quincy, Ill., at the Plumas M. & M. Co.

GEO. OTTERSON has charge Marshfield G. M. Co.'s placers near Marshfield, Coos county, Or.

T. K. CODE is superintendent Empire mine at Gold Valley, near Downioville, Sierra county, Cal.

H. H. DYER is superintendent Shannon mines at Metcalf, Ariz., succeeding W. T. Climo, resigned.

E. F. SPARROW has succeeded E. I. Leach as superintendent Gold Treasure M. Co. near Naco, Ariz.

M. G. HAVECK is superintendent Montgomery Shoshone M. Co., ¼ mile from Rhyolite, Nye county, Nev.

C. M. LAMB, superintendent Iyanough M. Co., at Dupont, near Lincoln, Nev., has been at Los Angeles, Cal.

E. J. COLLINS has been appointed superintendent Wolverine & Arizona M. Co. at Bisbee, Cochise county, Ariz.

J. L. SCHOFIELD, formerly of Deadwood, S. D., is superintendent Coronado C. Co.'s mines at Metcalf, Ariz.

A. D. MARSHAL has been placed in charge of work at the California and Black Cloud mines, near Wallace, Idaho.

A. M. JENNINGS is manager and R. Kellogg superintendent Southern Nevada M. & M. Co., near Searchlight, Nev.

N. T. MANSFIELD, manager Smuggler-Union mine at Telluride, Colo., has been examining mines, near Searchlight, Nev.

F. W. HOAR has been appointed manager Chiricahua Development Co.'s property at San Simon, Cochise county, Ariz.

C. LUCAN has been appointed general manager Lomas de Oro M. Co., working the Yauco mines near Rosario, Sinaloa, Mexico.

C. M. FUELLER has returned to Denver, Colo., from Chloride, Ariz., where he has been making examinations of mining property.

S. J. TRUSCOTT, superintendent Redjang Lehong mine at Lehong Donok, in Sumatra, will arrive in London, England, May 1.

WM. E. MILLER, secretary, and John Wilson, a director Arizona C. Co., have been at Clifton, Ariz., from Edinburgh, Scotland.

W. L. COBB, of San Francisco, Cal., is making an examination of the Glenn Con. mine, with a view of its development on a larger scale.

B. F. CLOSE, formerly superintendent Helvetia M. Co., has been appointed consulting engineer Arizona Commercial Co., at Globe, Ariz.

MR. NEVILLS of Chicago, Ill., will take charge of the Selby Smelting Works at Vallejo Junction, Cal., vice A. von der Ropp, resigned.

C. E. CONDIT, superintendent Astor M. & M. Co., near Eureka, San Juan county, Colo., has gone East, supposedly to purchase a milling plant.

JAS. McNAUGHTON, superintendent Calumet & Hecla M. Co. at Calumet, Mich., has been examining mines in the Warren district, near Bisbee, Ariz.

R. E. BREWSTER, president Harward G. M. Co., has returned to Boston, Mass., from a visit at the company's mine at Jamestown, Tuolumne county, Cal.

C. H. McMAHON has resigned as superintendent Motezuma Lead Co. of Santa Barbara, Chihuahua, Mexico, and has opened an office at El Paso, Texas.

A. WATTERS, in charge After Supper mine near Black Hawk, Colo., has been appointed local agent for

the Clark-Gardner mine on Quartz hill, near Nevada, Colo., owned by the Reme-Gardner M. Co. of Reme, N. Y.

B. S. REVETT, interested in hydraulic mining in California, Alaska and Colorado, has returned from San Francisco, Cal., to Breckenridge, Colorado.

D. H. LAWRENCE, Breckenridge, Colo., is consulting engineer Mary Verna M. Co., at Frisco, Colo., and the North American M. Co. at Uneva Lake, Colo.

H. E. WHIPPLE of Los Angeles, Cal., is superintending the construction of a cyanide plant for the Black Mountain M. Co. at Cerro Prieto, Sonora, Mexico.

R. D. EVANS of Boston, Mass., has been in San Francisco, Cal., attempting the consolidation and sale of Oroville dredging properties in which he is interested.

A. D. MARSHALL, formerly in charge Standard mine before its merger into the Federal combine, has accepted the management Heinz Lead & Silver M. Co., at Wallace, Idaho.

FRANK LONGMAID has resigned his position with the Velardena M. & S. Co. and is now with the Vacas-San Marcos M. & M. Co., Vacas, Durango, Mexico, as general manager of that company.

RICHARD HANCOCK, superintendent Mysore and Champion Reef mines in India, has retired on account of poor health, being succeeded by Arthur Gifford and T. E. Piercey, respectively, at these mines.

J. KIRK FIRTH has resigned his position with the Joshua Hendy Machine Works of San Francisco, Cal., and is now associated with the Allis-Chalmers Co., whose San Francisco, Cal., office is 623 Kohl Building.

P. B. ETESON, who for six years has been in charge of the Kia Ora dredger, near Oroville, Cal., has gone to Placerville, Idaho, to take charge of a dredger being built by the Risdon Iron Works of San Francisco, Cal.

J. P. TURNER has resigned as superintendent Yankee Con. mine, at Eureka, Utah, and for the present the property will be conducted by Consulting Engineer H. L. Burton and F. Gardinier and C. Zabriskie, shift bosses.

W. B. GRIFFITHS has resigned as engineer with O. y T. Braniff, Macon, Est. de Queretaro, Mexico, to accept the superintendency of the Guerrero Mining & Exploration Co., Los Grados, Rio Balsas, Est. de Guerrero, Mexico.

## Obituary.

W. L. COULTER, superintendent Paymaster mine, at Tonopah, Nev., died there April 11 of pneumonia.

J. E. HILL, JR., manager and secretary Pittsburgh Con. Co., at Alta, Utah, died April 8th of constitutional ailments.

## Commercial Paragraphs.

A. B. Saurman, Rialto Building, San Francisco, Cal., is Pacific coast manager for the Standard Underground Cable Co. of Pittsburg, Pa.

THE South Side Elevated Railway Co. of Chicago has contracted with the Westinghouse Electric & Manufacturing Co. for complete equipments of seventy cars, which includes 140 75 H. P. motors, and multiple control apparatus. The motors are of special design and are in line with the re-equipment of this system. The cars will be operated in trains of five, three of which will be motor cars.

THE Jeanesville Iron Works Co. reports recent shipments from their Denver, Colo., branch as follows: Victor Fuel Co., one compound pump, 800 gallons capacity, 650 feet lift, through 16,000 feet of pipe; one mine pump, compound, 800 gallons capacity; one high lift station pump to Boulder county; two sinkers to local dealers; four Wyoming steam separators to Mexico, five to Arizona, two to Salt Lake City, two to coal mines in Colorado.

THE Butters Copala Syndicate of San Francisco, Cal., has shipped to Mazatlan, Mexico, from the West Allis, Milwaukee, works of the Allis-Chalmers Co. two heavy duty Reynolds-Corliss engines. These, with other heavy machinery included in the order, are to form part of a large plant to be installed by Sept. 1, 1905, at the mines of the syndicate, where a complete cyanide plant is under construction. The Butters Copala Syndicate has acquired the contract that Chas. Butters & Co., Ltd., had with Felton Bros. of Mazatlan to operate the properties of Felton's Copala Mines, Ltd. These constitute a consolidation of the properties in and about Copala, Sinaloa, Mexico.

H. L. SINCLAIR, 1744 Broadway, Denver, Colo., representative of the Hardsog Wonder Drill Co., Ottumwa, Iowa, reports the sale of one belt-driven compressor and two drills for the Tornado M. Co., Del Norte, Colorado; machines for the Lucania Tunnel Co., Idaho Springs, Colo., and drills for the West Gold Hill M. Co., Tincup, Colo., and drills for the Gold Cup M. Co., Tincup, Colo. The main office at Ottumwa report the sale of fifty machines in one order to the Langlaagte Estate M. Co., Johannesburg, South Africa. The Langlaagte Estate M. Co. purchased one of these drills some time ago and made a thorough test of it, and the next order was for six and one ton of bits, and then increased their order to fifty more.

COLORADO IRON WORKS Co. of Denver, Colo., report recent shipments as follows: One carload of smelting machinery to the Lost Packer Co. in Idaho; two car-



loads of concentrating machinery to the El Cobre Co. in Cuba; three carloads of smelting machinery and equipments to the National Metallurgical Co. in Mexico; one carload of smelting machinery to the Mowry Mines Co. in Arizona; impact screens to the Western Ore Supply Co. in Utah and the Economic Gold Extraction Co. in Colorado; a special order of slag trucks for the R. J. C. Mining Co. in Mexico; smelting equipments, consisting of jackets and special machinery, for the North American Copper Co. in Wyoming and smelting machinery and supplies to the Independent S. & R. Co. in Colorado. A 48x160 silver-lead furnace for the Compagnie Francaise des Mines du Laurium, operating in Greece, was shipped this week.

THE J. Geo. Leyner Engineering Works Co. of Denver, Colo., manufacturers of rock drills, air compressors, hoisting engines, etc., report among recent shipments: One 18x22-inch simple steam actuated, two-stage air compressor; two 16x18-inch two-stage air compressors, direct connected to electric motor; one 12x14-inch two-stage air compressor, direct connected to electric motor; three upright duplex steam-actuated air compressors; twenty-four Water Leyner rock drills. For the Gunnison irrigation tunnel, one 22x26-inch compound steam, two-stage air compressor; one 16x18-inch compound steam, two stage air compressor; one 10x12-inch simple steam, single-stage air compressor; two 9x12-inch double cylinder, friction clutch, geared hoists; five 80 H. P. boilers; two small vertical boilers; a number of Water Leyner drills, mine cars, etc. In Colorado they also report sending to the Cripple Creek Homestake Mining Co. one 16x18-inch simple steam actuated, two-stage air compressor; one 12x20-inch double drum hoist; one 125 H. P. boiler; Water Leyner drills, etc. Maid of Orleans mine, 16x18-inch simple steam actuated, two-stage air compressor; 10x14-inch double cylinder, friction clutch, geared hoist; 125 H. P. boiler; Water Leyner drills, etc. City of Cripple Creek Mining Co., 16-18-inch simple steam actuated, two-stage air compressor; Water Leyner drills, etc. St. Louis Mining Co., 12x14-inch simple steam actuated, two-stage air compressor. Rogers & McCreary, upright duplex, belt-driven compressor; Leyner rock terrier drills. American Zinc & Chemical Co., 10x12-inch simple steam, single-stage air compressor. Standard Coal & Land Co., 14x16-inch simple steam actuated, two-stage air compressor. Sunnyside Coal Co., 10x14-inch double cylinder, friction-clutch, geared hoist. Newcastle Coal Co., 6x8-inch double cylinder, friction-clutch, geared hoist. To Nevada, for the Giroux Consolidated Mines, a 10x14-inch double cylinder, friction clutch, geared hoist and an 80 H. P. boiler. California, Union Copper Co., 14x16-inch simple steam actuated, two-stage air compressor; 12x16-inch double drum hoist; Water Leyner rock drills, etc. Washington, Copper World Extension Mining Co., 12x14-inch simple steam actuated, two-stage air compressor; Water Leyner drills. Arizona, Weldon Gold & Copper Co., 8x10-inch double cylinder, friction-clutch, geared hoist, etc. Sweden, two upright, belt-driven, duplex air compressors, drills, etc.

## Trade Treatises.

Bulletin 53 A from the Sullivan Machinery Co., Chicago, describes their straight-line two-stage classes W B 2 and W B air compressors.

The Ajax drill sharpener and Ajax armored pneumatic blasting car are described and illustrated in detail in a 16-page pamphlet issued by the manufacturer, T. H. Proske, 1734 Fifteenth street, Denver, Colo.

The second number of "Air Power," published by the Rand Drill Co., 128 Broadway, New York City, contains "Natural Gas Pumping Plant at Hundred, W. Va.," "Graphics of Boyle's Law" and "Economy in the Operation of Coal Mines From Power Plants."

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING APRIL 4, 1905.

786,710.—SHINGLE GAGE—A. Anderson, Bellingham, Wash.  
786,403.—CAN TOPPING MACHINE—H. C. Black, San Francisco.  
786,404.—CAN TESTING MACHINE—H. C. Black, San Francisco.  
786,480.—CASING SPEAR—J. J. Breuster, San Francisco.  
786,482.—FRUIT PITTER—J. Caldwell, Los Angeles, Cal.  
786,265.—ORE CRUSHER—A. C. Calkins, Los Angeles, Cal.  
786,484.—PIANO CHAIR—Mary C. Carrick, San Francisco.  
786,266.—FURNACE—N. Cartmel, Los Angeles, Cal.  
786,729.—CURTAIN HANGER—J. J. Cochran, San Francisco.  
786,487.—HOP PICKING BASKET—F. W. Craver, Santa Rosa, Cal.  
786,489.—TROLLEY POLE—M. O. Dolson, Los Angeles, Cal.  
786,432.—VALVE GEAR—W. R. Dow, Boulder Creek, Cal.  
786,562.—CAMERA—G. Hassell, San Francisco.  
786,761.—STEAM GENERATOR—C. E. Hastings, Griffin, Cal.  
786,788.—WRENCH—M. F. Hudson, Los Angeles, Cal.  
786,787.—VISE—M. F. Hudson, Los Angeles, Cal.  
786,441.—FILTER—B. Hunt, San Francisco.  
786,500.—PUMP—A. A. Kepner, Lemon, Cal.  
786,571.—PAPER HOLDER—G. Laube, Los Angeles, Cal.  
786,505.—JAR TOP REMOVER—W. F. Loofhourrow, Issaquah, Wash.  
786,506.—MOP HOLDER—J. C. Look, Tudor, Cal.  
786,451.—HINGE—J. Lupino, Los Angeles, Cal.  
787,773.—BRIQUET MACHINE—H. E. Marsh, Los Angeles, Cal.  
786,500.—STAMP MILL—A. McCombie, Grass Valley, Cal.  
786,395.—FLUMES—G. T. McIntyre, Riverside, Cal.  
786,581.—PROCESS—H. E. Miller, Oakland, Cal.  
786,672.—EXERCISING APPARATUS—G. H. Pfund, San Francisco.  
786,534.—PUMP—J. Richards, San Francisco.  
786,316.—RAILWAY SIGNAL—W. G. Roome, Los Angeles, Cal.  
786,526.—PIRE SCREEN—V. P. Solom, San Francisco.  
786,529.—APPLYING REMEDIES—D. A. Stapler, San Francisco.  
786,692.—ENVELOPE FASTENER—E. J. Steventon, Davisville, Cal.  
786,693.—SOFA AND TABLE—N. B. Stone, Outlook, Wash.  
786,335.—SAW HANDLE—D. Worden, Whatcom, Wash.

## Dividends.

The Reco M. Co. of Sandon, B. C., will pay 2% dividend April 20.

## Latest Market Reports.

SAN FRANCISCO, April 14, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 56½c, refined (1000 fine); San Francisco, 56½c; Mexican dollars, 46c, San Francisco; 43½c, New York.

COPPER.—New York: Standard, \$15.37½; Lake, 1 to 3 casks, \$15.25@15.37½; Electrolytic, 1 to 3 casks, \$15.37½; Casting, 1 to 3 casks, \$14.87½. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: \$67 7s 6d spot per ton.

Following are the figures for the German consumption of foreign copper for the months of January-February, 1905, compared with the same period of time for 1904-1903:

	1905.	1904	1903.
Imports, tons.....	15,884	19,778	12,504
Exports, tons.....	1,937	1,215	1,725
Consumption, tons.....	13,947	18,563	10,779

Out of the above, 13,099 tons were imported from the United States.

The difference between the figures representing the consumption of copper during the several periods above mentioned does not necessarily represent the actual condition of the industries in Germany at these periods, for the succeeding months may show a greater or less amount consumed. The demand for copper in electrical work in Germany is constantly increasing, as it is in every progressive country where industrial life is such a pronounced feature of its existence. The United States, Germany and England are the principal consumers of the copper production of the world, though vast amounts are used elsewhere.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 16s 3d pig long ton.

SPELTER.—New York, \$6.00; St. Louis, \$6.15; London, £23 12s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.95@31.25; San Francisco, ton lots, 32c; 500 lbs., 31½c; 200 lbs., 32c; less, 33c; bar tin, 34c, 35@37½c. London, £145.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.75c.

ZINC.—Metallic, chemically pure, 50c; dust, 40c; 10c; sulphate, 30c, 40c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, har, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, har, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 4c per lb. above kegs price; in 1 and 5-lb. tin cans, 100 lbs. per case, 4c per lb. above kegs price. Dry Lead.—In hhls., 1 ton and over, 6½c; do. in kegs, 7c.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, hhls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B. 1½@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, hoiled, bbl., 60c; cs., 65c; raw, hbl., 58c; cs., 63c; Lucol oil, hoiled, hbl., 51c; cs., 56c; raw hbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c, Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal iron hhls., 18c; wooden hhls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, hulk, 16c, do., cs., 22½c; 86° Gasoline, hulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, hbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, per lb., 80c.

PHOSPHORUS.—American, per lb., 70c.

SODIUM.—Metal, per lb., 60c.

BISMUTH.—Subnitrate, per lb., \$2.10.

URANIUM.—Oxide, per lb., \$3.50.

MERCURY.—Bichloride, per lb., 77c.

TUNGSTEN.—Best, per lb., \$1.25.

SILVER.—Chloride, per oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Black oxide, per lb., 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads per 1000, f. o. h., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

DEVICE FOR APPLYING REMEDIES.—No. 786,529. April 4, 1905. D. A. Stapler, San Francisco, Cal. This invention relates to a device which is especially designed for applying remedies or medications to wounds, cavities and the like. The object of this invention is to provide a flexible expansible tampon having a cavity or depression formed at one end within which the remedy may be contained and means for expanding the tampon to correspondingly expand and fill the cavity and to maintain the remedy or medication in contact with the part to be treated.

HOP PICKING BASKET.—No. 786,487. April 4, 1905. F. W. Craver, Santa Rosa, Cal. This invention consists in a containing basket comprising an exterior trussed wire frame with top and bottom rings to which said frame is united, transverse wires fixed across the bottom ring, an interior flexible portion having a bottom to rest upon said transverse supports, an interior ring by which the bottom is extended means for connecting said ring with the bottom ring of the frame, and means by which the upper portion of the fabric is extended and connected with the top ring of the frame.

PIANO CHAIRS.—No. 786,484. April 4, 1905. Mary C. Carrick, San Francisco, Cal. This invention relates to an attachment for chairs and like supports which are used by piano and musical instrument players, and its object is to provide an adjustable support for the back and a means for supporting music therefrom when performers are playing together, and also a means for holding music which is not in use. It consists in a piano or like chair, of a channeled guide having its upper surface substantially flush with and transverse to the seat, a slide movable in the guide and a vertically disposed guide carried by the slide, an independent back having a slide movable in said vertical guide, and means for locking both slides in their guides.

STAMP MILL.—No. 786,590. April 4, 1905. A. McCombie, Grass Valley, Cal. One-half assigned to James McCombie, Chicago, Ill. This invention comprises in a stamp mill vertically guided reciprocating stamps, a crank shaft, flexible ropes connecting with the cranks and turnable connections upon the stamp stems, ratchets through which the stems are slidable and feathers turnably connecting the stems and ratchets, spring-pressed pawls engaging the ratchet teeth, a fulcrumed lever upon which said pawls are pivoted, a second fulcrumed lever, means engaging the two levers, a cam carried by the crank shaft with which cam the lever engages, and by the movement of which the pawls alternately engage and move the ratchets. This improvement is designed to reduce the frictional resistance and increase the rapidity with which the stamps may be reciprocated.

AN excellent leveling instrument may be made from three pieces of 1x4 lumber, or even lighter, arranging them in the form of the letter "A," giving the legs a broad base. A good height is 5 or 6 feet with a base of 10 or 12 feet. A plummet is suspended by a fine wire from a notch cut at the apex of the "triangle," as it is usually called. The instrument is placed on level ground, or on a floor, and the point indicated by the plumb line is marked on the cross bar. The bar may then be carefully marked for varying grades by placing a small block under one leg, say 1 inch thick, and the point marked on the horizontal bar. When in use one man holds the frame and another lifts the front end until the plumb line coincides with the mark at the point determined as the proper gradient, and a peg is driven there. The rear end is then placed where the front end had ditched and the second peg driven. By this means a ditch or tramway grade may be quickly and accurately established.



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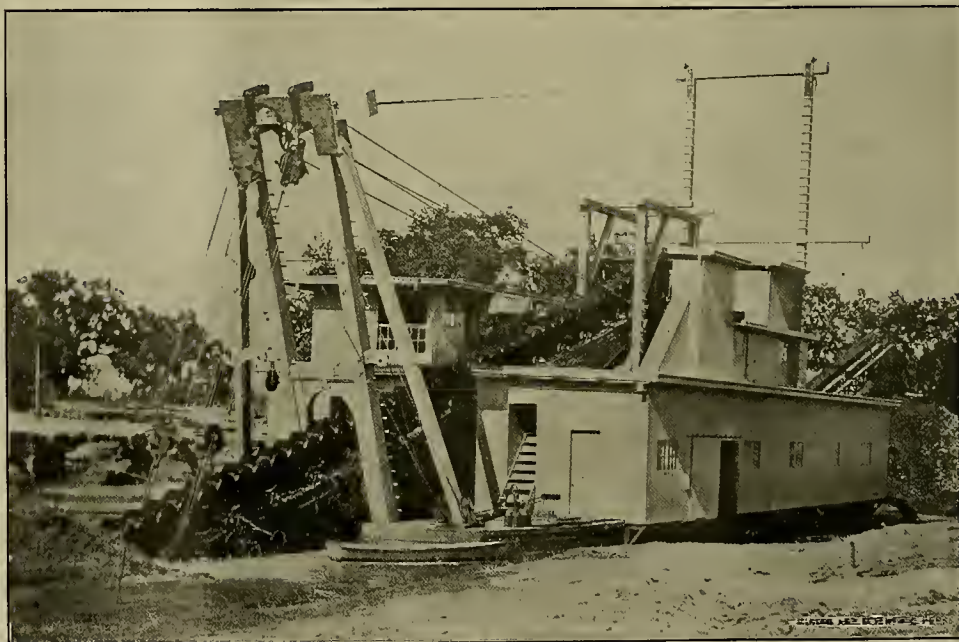
## Dredging for Gold.

Ever since the first attempt to dredge for gold in California this class of mining has attracted a great deal of attention. Before dredging was introduced into California, or elsewhere in the United States, dredgers were in what was at that time considered successful operation in New Zealand, but the dredgers of that time (prior to 1887) could scarcely be compared to the great machines in use in California, Idaho, Colorado and other Western States to-day, for either capacity or efficiency. The first dredger operated in California was at the Lambing mine, near Lone, in Amador county. It was a dredger provided with what is known as the "orange peel" bucket, the machine consisting of a single bucket of four segments. This dredger was successfully operated during the summer of 1887 at the place indicated, and produced from \$8000 to \$12,000 per month. The crew consisted of twenty-five to thirty white men and a larger number of Chinamen, working two shifts. The capacity of the bucket was 2 cubic yards. This dredger operated to a depth of 30 feet, the depth to bedrock. The machinery was housed and the entire outfit was shifted about on heavy sills in much the same manner that a house is moved along the streets of a city. This dredger was considered efficient in its day, but would make a poor economic showing by the side of the modern machines costing \$75,000 or more each, several of which are illustrated on this page. Elsewhere herein is a description of the modern dredger, with much of the detail of its construction and operation. Prior to the introduction of any type of mechanical dredger for gold mining, suction pumps were tried at many places in California, Montana, Dakota, Colorado, and in other mining regions, and one of the first type of dredger was a suction arrangement, but these devices, depending upon suction pumps alone, have not as yet found extended use where coarse material had to be handled. A later and more successful device was the hydraulic ejector, or elevator, many of which have been introduced throughout the placer mining regions of the West, and which have been found particularly useful where the gravel bed was below the drainage level.

THE reason some capitalists profess to prefer low-grade mines to those producing high-grade ores is due to the fact that ordinarily high-grade ores do not occur as great masses or broad veins, but are more restricted as to size. It does not necessarily follow that small veins are always high grade, for many veins of small or moderate size are also sufficiently low in value to satisfy the most exacting. It



A Modern Dredger Under Construction. (See Page 252.)



Breaking the Surface With a Modern Dredger. (See Page 252.)



Bucket Dredger, Showing Method of Stacking Tailings. (See Page 252.)

is due largely to the fact that such mines as those of the Homestake group and the Alaska-Treadwell mines, which produce low-grade ores, have made a long continued success, extending over a period of twenty to thirty years, that low-grade mines have come to be looked upon as offering less risk to the investor, with long-continued output and consequent possible profit. In the history of such mines there are usually many changes, and, as the mine workings go deeper, the expense is naturally expected to increase; but in the case of the Homestake it has actually been decreased. Mining and milling are accomplished there at considerably less expense per ton than in earlier years. This is due to improved machinery and methods in all branches of both mining and metallurgy.



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## Copper and the Market.

The output of Lake Superior copper mines is now 19,300,000 pounds per month, or over 230,000,000 pounds per annum, with the probability of an increase from new development now in progress. At present the output of that noted district is nearly one-third of the entire production of the United States. Arizona's production is close to 200,000,000 pounds, with every indication of being maintained for a time, if not increased, for there are still large undeveloped copper resources in Arizona, and as the older mines are exhausted new ones may be expected to take their place, thus maintaining the output. With copper at the present price there is an additional incentive to open and equip new mines at points distant from the railroad, but which would quickly be provided with railroad transportation when the value of the mines justified it. Montana leads in the copper production, the output of that State being now about 310,000,000 pounds annually, chiefly from Butte mines. Mexico's production is at present over 100,000,000 pounds annually and is increasing. The other most important copper producing countries are Chili, Japan, Australia and Germany. The market is controlled by the Amalgamated Copper Co. and the Calumet & Hecla Co. Copper slowly advanced during the latter part of 1904 from 12½ cents to 15 cents and a fraction, at which latter price it now stands. The demand for the metal is strong and actually increasing, and while certain copper mining stocks have doubtless exaggerated market values at this time, a drop in stock does not necessarily indicate a drop in metal prices. Every copper producer is anxious to see the price maintained, and nothing but market manipulation is likely to lower the price of the metal, whatever may have happened to copper mining stocks. For the past ten years the production of copper in the United States has increased steadily. Within that time Arizona's production has increased from 38,000,000 pounds per annum in 1894 to over 170,000,000 pounds in 1904. The Lake Superior district in 1894 produced something over 100,000,000 pounds. Since then the output has annually grown larger, with the exception of 1899, 1900 and 1901,

when there was a temporary halt in the increase, but with a more marked increase in 1902, 1903 and 1904. Montana has steadily increased from 160,000,000 pounds in 1894 to 280,000,000 pounds in 1904, with every promise of a large increase for 1905. This indicates that there has been a steadily increasing demand for copper during the past decade, which no fluctuations of the stock market has influenced. If the demand did not absorb the supply in this manner there would be millions of pounds of copper on hand, but such is not the case. Consequently the market promises to remain firm at present prices, or near them, and any fall in the price of the metal can only be temporary at most. This is clearly indicated by the official report, issued April 3, to the effect that the world's total visible supply was only 16,745 tons.

## The Need of Careful Investigation.

The frequency with which mistakes are made in the premature installations of mining and metallurgical plants, particularly of the latter, is a matter of constant surprise in the light of the experience which this age affords. This is emphasized in an article appearing elsewhere herein under the title of "Place and Value of Small-Scale Ore Tests," wherein the author advises the thorough testing of small amounts of ore to first determine its character and the proper method of its beneficiation, and then the construction of a unit plant of full size, complete in detail, and the demonstration, on a commercial scale, of the process evolved by laboratory experiment. The wisdom of this advice cannot be doubted, as is too often shown in idle mills and reduction works built at great cost, but wholly unsuited to the treatment of the ore of the mine for which they were built. Formerly, when metallurgy was not in so advanced a stage as at present, there could usually be found an excuse for such premature installations, but not so in these days, and yet, these occurrences, by courtesy called mistakes, are not infrequent. Over twenty years ago an Eastern company operating in the Black Hills of South Dakota expended many thousands of dollars in the attempt to work the rebellious telluride ores of the Bald Mountain district. A 20-stamp mill was built. It was unable to give capacity and at the same time crush the ore fine enough, and the stamps were taken out, the mill remodeled and half a dozen pulverizers, of a popular type in those days, were installed. These proved of little use, and were in turn rejected and the twenty stamps replaced. These were then supplemented with six large grinding pans, similar to the pans in silver mills. These required a largely increased power, which was provided. Still the ore was refractory to every method tried—chiefly various kinds of amalgamation. Chlorination was suggested, but rejected as too expensive. The stamps were again torn out and a new type of pulverizer—rolls was tried. This was no more successful than the other devices, and the company, at last discouraged, gave up the effort and waited for science to seek out a method in the coming years. These repeated endeavor to treat refractory ores were certainly deserving of greater success than attended these efforts. The only regret which the company could entertain should be that the tests were not made on a less elaborate scale, for in each instance a mill was built that should have been capable of treating at least fifty tons daily, when the same knowledge might have been gained with a 1-stamp battery or a single pulverizer. These ores are now successfully treated by cyanidation or chlorination, for they are no more amenable to amalgamation to-day than they were at that time. Even to-day may be seen similar honest effort wasted in the endeavor to work out a metallurgical process which will successfully treat a refractory ore, appearing in the shape of a large, fully equipped plant, when it is not known that the process and the machinery are adapted to the ore. Make the small tests first, and when the laboratory experiments have demonstrated the probable adaptation of a certain line of treatment to the ore, it will be time enough to build a full-sized unit plant to prove that the intended process will do what the experimenter thinks it will. Having demonstrated this fact, it will then be the proper time to put in a plant of a size and capacity commensurate with the possibilities of the mine to supply ore continuously.

IN the history of mining there have been many very strange and unexpected changes. The one-time lead mines of Missouri are now producing almost exclusively zinc ores. The Horn Silver mine of Utah was at one time a large silver-lead producer, but now ships large amounts of copper ore. The great copper mines of Butte, Montana, were originally worked exclusively for gold, and later for gold and silver. The Mount Morgan mine of Queensland, Australia, produced originally gold only, but within the past two years it has become a producer of considerable copper. The tin mines of Cornwall were originally mostly worked as copper mines. The great silver mines of Cerro de Pasco in Peru are to-day being equipped for the production of copper and promise to become an important factor in the copper world. Leadville, Colo., was originally a gold-producing placer camp. In 1877 it began its famous production as a lead-silver district, and to-day it produces gold, silver, lead, copper and zinc. The Bingham district of Utah was at one time a gold-silver camp. Its production is now largely copper, gold and silver. Twenty years ago some prophesied that the Homestake mine at Lead, South Dakota, would in depth become a silver mine, but at its present depth of 1200 feet there is no evidence of this anticipated change. The early miners in the Cœur d'Alenes of Idaho gave scant attention to the lead-silver ores which have since become such an important factor in the lead market of the world, and which have sustained the camps in that district and permitted the founding of an enduring industry. Instances of these changes might be multiplied almost indefinitely, but a sufficient number of cases have been cited to show that any district may anticipate radical changes from the conditions originally obtaining in them.

THE Dolcoath tin mine is one of the oldest mining properties in England. It has produced a large amount of tin and also of copper. In the treatment of the ores of this famous old mine there has always been what has been looked upon as an unavoidable loss in ore dressing, particularly in the slimes. Recent experiments made there indicate that from now on these slimes will be successfully treated, and the ore contained in them saved. This is merely illustrative of the progress of the times which has invaded even conservative Cornwall. It seems strange when it is considered how much the mining world at large owes to the experiences gained in Cornish mines that the managers of these mines should be so slow to adopt in their mines and metallurgical establishments the machinery and methods so successfully applied elsewhere. Wherever on earth mining is done, there will be found expert Cornish miners, and some of the most satisfactory methods in both mining and metallurgy in common use throughout the world had their origin in the Cornish tin and copper mines, still the Cornishman at home is ultra conservative and usually slow to pattern after his more progressive brothers who are working mines elsewhere.

SO vigorously have old tailings piles from gold mills been bought by cyanide operators during the past ten years that there now seems but few accumulations of tailings remaining untreated that will afford a profit. Many such piles of mill refuse have added millions in gold to the wealth of the world, and in many instances also incidentally to the pockets of the operators, but many, also, have failed to yield the anticipated profit. In some cases these ventures have failed to pay for the plant built to treat the material. Cyaniding is at present almost wholly confined to the treatment of sands and slimes coming direct from the mills. So eagerly have the old tailings piles been looked up that in a number of instances the more bold or less experienced cyanide men have undertaken the task of treating the tailings from silver mills, but up to this time these ventures have not proven successful, except in rare instances, where there was also a considerable amount of gold associated with the silver. The extraction on these silver tailings is usually less than 60%, and in many cases much lower than this. It may be anticipated, however, that further improvements will be made in the process which will make the silver tailings and ores cheaply amenable to some modification of the process, which in the past has already undergone numerous changes for the better.



## CONCENTRATES.

By refractory ore is meant ore which is difficult of treatment. It was originally applied to any gold-bearing ore which could not be successfully amalgamated.

THE chief advantages of steel over iron are its greater elasticity and the property which permits it to be hardened by tempering to almost any degree of hardness.

AN acre of ground is 208.71 feet square and contains 43,560 square feet. A reservoir covering one square acre would contain for each inch of water it held in depth 27,154.291 U. S. gallons.

WHERE substantial mine tracks are required good sized ties must be properly laid, and the rails spiked down. Fish plates are not absolutely necessary, though often used on outside tracks.

PULLEYS should be so run and belted that the slack of the belt shall be on top. This causes the belt to have a greater surface contact on both pulleys, with consequent greater transmission of power.

NO LAW was passed by the last California Legislature requiring that a corporation (mining or otherwise) should own the property in fee before it could issue stock and sell the same to the public.

CAR and skip wheel axles should be of round bars of cold rolled steel. If the ends become worn the bar may be cut in the center, the outer ends welded and the wheels placed on the newly formed ends.

TO ascertain the number of revolutions a pulley will make when belted to another pulley, or flywheel, multiply the number of revolutions of the driving wheel by its diameter in inches and divide by the diameter of the driven pulley.

GOOD tests for zinc blende are the color of its streak or powder, always grayish to brownish, and a drop or two of hydrochloric acid on zinc blende evolves sulphuretted hydrogen ( $H_2S$ ), which may at once be detected by its odor.

THE rails used in mine tracks usually weigh twelve to sixteen pounds per yard. These rails are of variable length, but are generally about 20 feet long. Longer rails are difficult to handle in many mines owing to lack of room at the stations.

THE tonnage of country rock extracted in mining work may usually be estimated on the basis of 13 cubic feet per ton removed. Each lineal foot of a drift 8x5 feet clear will produce about three tons of rock. This varies slightly in different rocks.

NATIVE silver is frequently found associated with copper in a gangue of calcite in the upper levels of some of the Lake Superior copper mines. Neither of the metals is alloyed with the other, both being in a state of unusual purity. No gold is known to occur in these ores.

PRIOR to May 10, 1872, when the present Federal mining laws became effective, there were certain local districts where the lode locations were square and no extralateral right attached, the locator being confined to the planes of his surface boundaries drawn downward vertically.

AS a record of hoisting, the No. 1 coal mine at Doukville, Ill., recently hoisted 2928 tons of coal in eight hours. There are no metal mines doing anything approaching this, and few coal mines. At Kimberley, it is said as much as 8000 tons have been hoisted from a depth of 1500 feet in twenty-four hours.

COPPER MATTE is an artificial sulphide of copper and iron which usually contains gold and silver, and sometimes antimony, lead, zinc, bismuth and other metals. To determine the value of the matte the amount of each of the metals present must be determined, though the gold and silver are usually of the most importance, after the copper.

IN the desert regions water can be maintained at an agreeable temperature, by keeping it in a canvas sack, hung in the shade and open to the free circulation of the air. The temperature of the water is usually several degrees lower than the temperature of the surrounding air, due to the rapid evaporation of the water on the outside of the sack.

IN some quartz mills having flat bottomed ore bins it is the practice to keep the bottoms covered with a sloping floor of waste, just sufficient to allow the ore to run to the chutes without mingling with the waste. This protects the bottom of the bin, but seems to have no other advantage other than aiding in giving the mill structure steadiness, by reason of weight.

SECTION 8 of the mining law of May 10, 1872, contains the following: "Where a patent shall be issued for claims on unsurveyed lands, the Surveyor-General, in

extending the surveys, shall adjust the same to the boundaries of such patented claim, according to the plat or description thereof, but so as in no case to interfere with, or change the location of, any such patented claim.

THE solid matter in ocean water is 2139 grains per gallon, and that in the Dead Sea about 19,700 grains per gallon. The amount of saline and other soluble material held in solution in salt lakes varies with the rainfall, some years it being greater than others. In stages of low water the quantity per gallon increases, and in stages of high water following heavy rains it becomes less.

WHERE the track admits of it, a larger skip may be used in a shaft by placing the wheels on lugs bolted to the sides than by having them on axes passing underneath the skip. The former allows the skip to sink to the level of the rails, and even below them, where the rails are placed on longitudinal stringers, as is often done, particularly where strap rails, instead of T rails, are used.

SILLS, posts and other woodwork placed in contact with the ground may be given a longer life and kept from decay by covering them with a coating of cement, the covering being held in place by a wire netting wrapped around the timber, being kept away from the timber by small wooden blocks. Poles thus prepared have been in use to support electric wires in Europe for several years, and have proven satisfactory.

THE conditions which insure a steady and abundant flow of water in mountain streams is not so much heavy rainfall as a heavy snowfall in the mountains, and for the best results it is the snow which falls in the early part of winter, and which becomes hard and compact during the winter season by successive rain and snowfalls until it is almost a mass of ice rather than snow. This melts slowly and maintains the summer supply.

FOR the purpose of comparison, a "volt" of electricity is sometimes likened to 1-foot head of water, and the volume of flowing water is sometimes compared to current of electricity, the unit of current being the ampere. The comparison is not absolute, for it merely indicates, in a general way, the similarity of the electric current and a stream of water flowing through a pipe. If the comparison be carried too far it is likely to lead into error.

BY "ore-in-place" is meant ore which occurs within walls of solid rock—not a placer. In some mines the rocks near the surface are soft and easily dug with pick and shovel, or by sluicing, hydraulicking, etc., such as some of the so-called seam diggings. Although often these mines are worked to considerable depth in the same manner as placers, the deposits of this character are rock in place, and subject to location under the lode claim laws.

IN running a tunnel where it is the intention to make it of large size it is often wise to first run a tunnel of smaller section, which may later be enlarged when it becomes necessary. Large tunnels are often run for mining purposes the size of which is not justified by the available ore, or other economic conditions. Tunnels of small cross section usually cost more per cubic yard extracted than in large ones.

THE crank pin and crosshead of an engine do not travel at the same rate throughout a revolution of the crank shaft. The crank pin travels at a constant speed, but the crosshead is constantly traveling at an accelerating or diminishing speed throughout the forward and backward stroke, coming to practically an absolute but only momentary standstill at either end, the duration of rest being so small that it is claimed by some that the crosshead does not actually stop at all.

IN building a trestle to carry ore trains of ordinary size it is not necessary to use heavy timbers such as are ordinarily employed in building railway trestles. A firm and safe trestle may be made of 2x6 or 2x8 lumber by building up legs, using two pieces of the timber and separating them by cross braces, either horizontal or inclined, or both, depending on the height of the trestle. Such a structure may be safely carried to a height of 30 feet, or more, with no stick larger than 2x8 inches.

WHERE a locator has taken a placer claim adjoining a senior placer claim, located prior to July 9, 1870, the boundaries of which did not conform to the Government survey (which under that law was not essential), the law provides that "where placer claims cannot be conformed to legal subdivisions, survey and plat shall be made as unsurveyed lands." Sec. 10, Act of 1870, amended by mining act of 1872. The fractional claim lying between the old claim of 1870, and the land survey line in the vicinity, which claim constitutes a fractional claim (less than twenty acres) may be located as such fractional claim, having the land survey lines, and the lines of the prior claim as boundaries. This fraction is subject to the requirements of the law the same as full claims.

ONE of the most frequent causes of boiler explosion is the sudden entry of cold water into a highly-heated boiler in which the water is at a low stage. The rapid expansion of the newly created steam raises the pressure to the point of resistance of the boiler or beyond it.

When it is discovered that the water gauges show no water, the fire should be immediately drawn, if not a heavy one. If the fire be a large one, cover it with wet ashes at once. Either of those expedients will have the effect of lowering the temperature to a point where it will be safe to turn water into the boiler again. In boilers a large part of the mineral and other matter in the water which make scale if allowed to remain rises to the surface when the water reaches the boiling point, and it may then be blown out by opening the surface blow-off cock. This disposes of the foreign matter before it has the chance to form scale.

A WATER-TIGHT DAM may be constructed in the level of a mine of concrete by using board moulds in the usual manner of building concrete walls. It will be necessary to leave a manhole through which the workmen may pass out after having completed the dam, the top portion being finished from the inner side. The dam must be built into channels cut in the rock—in the floor, sides and roof of the drift—and it would be a wise precaution to reinforce it by the use of iron or steel bars like pieces of railway iron. The manhole should be closed by a steel plate provided with a suitable gasket. It is usual to also place a water pipe, securely anchored, in the lower part of the dam, and to provide the pipe with a valve, to control the flow of water. By placing a pressure gauge on the outside of the dam, and between it and the valve, the water pressure and consequently static head may be determined, but this gives no idea of the volume of water backed up behind the dam.

THE transfer of alignment of mining work down a shaft is one of the most difficult and delicate operations the engineer has to perform, and the deeper the shaft and the longer the line of connection with the other workings the more care required. He must determine the direction and elevation of a line which may be several thousand feet in length, by a base line which at most can not be longer than the length of the shaft. This being the case, the need of extreme accuracy in determining the direction between two points in the shaft is apparent. Various expedients are resorted to in this class of engineering, but the most common practice in the case of vertical shafts is to lower two heavy plumb-bobs from fixed points at the surface to within a few inches of the bottom of the shaft. For this purpose various sized weights are used, from 50 pounds to as high as 250 pounds. Lead is preferable to iron, as the specific gravity of lead is greater, and a bob of given weight takes up less space. Piano wire is generally used in this class of work, and the bobs are allowed to swing freely in a tub of some liquid, usually molasses, crude oil and sometimes water. In doing work of this kind it is very necessary that air currents be reduced as far as possible, for it is known that these currents have the effect of causing the wires to vibrate sensibly. Some experiments made in one of the deep shafts of the Tamarack mine, near Houghton, Mich., showed that there was a discrepancy in the distance between two suspended wires at the surface and at the bottom of a shaft 4250 feet deep of about 0.11 foot. It was supposed to be due to air currents. The wire used was No. 24 piano wire. In inclined shafts and those of irregular dip, and not having straight alignment, the difficulties are multiplied.

THE scorification assay is well adapted to the high-grade ores, and particularly those rich in silver sulphide. The reagents employed are pure granulated lead and borax glass. The lead forms an alloy with the precious metals of the charge, that portion of the lead which is oxidized combining with the borax and impurities and gangue of the ore to form a slag. The amount of lead and borax varies with the character of the ore treated. In a quartz ore no borax glass need be added. It is customary to take one-fifth assay ton of ore and forty to fifty grams of lead. The ore is mixed with half the lead and placed in the scorifier, the balance of the lead being spread over the top of the mixture. On top of this are placed two or three small lumps of borax glass the size of a pea. In scorification there are four stages to the operation—melting, roasting, fusion and scorification. A high heat is at first applied, which melts the lead. The ore rises to the surface and floats on the molten lead. In this condition the ore is roasted by a somewhat lower heat, by opening the muffle. The roasting continues until no more fumes appear, and the ore has settled into the lead. The heat is then raised and all the material fused. When fusion is complete pure white fumes come from the charge, the slag encircles the molten lead and brilliant colors play over its surface. It is here that the borax glass performs its most important function in making a fluid slag. If no borax were added to the charge, where much gangue is present, the slag is likely to float in detached masses on the lead and give some trouble. When the fusion has been completed the heat is lowered until the ring of slag spreads out and finally covers the lead. The heat is then again raised to make the slag more liquid, so that any particles of lead inclosed within it may separate and go to the main mass below. The scorifier may then be removed from the furnace, and either poured or allowed to cool. The button should be hammered in the usual manner. It should be soft, malleable and not weigh over 12 or 13 grams. The scorification assay, while taking less trouble in preparation than the crucible assay, requires more skill and careful attention than the latter. If the lead button is too large for convenient cupellation scorify with some borax glass until reduced to proper size.



## South African Methods.\*

NUMBER II—CONCLUDED.

Written by THOMAS H. LEGGETT.

**WATER.**—It is a well-known fact that the mines of the Rand have very little water to contend with. It is very fortunate that this is so, since the average yield of the seventy to eighty producing mines for the last few years has only been 41 shillings per ton, or, say, \$10. It is evident that this grade of ore would not permit the handling of large quantities of water from great depths. The one mine that has been afflicted with a heavy inflow of water is the Knights Deep, where they raise from 1,000,000 to 1,250,000 gallons of water per day, from a depth of 1200 feet. They pump this in a single lift by means of electrically driven high-speed Riedler pumps, of which they have three in their underground station, each with a capacity of 450,000 gallons per day. It may be interesting to note that during the dry season on the Rand the water from this mine has been sold at such a rate as to more than cover the cost of pumping.

**TIMBER.**—This is a material required but very little in the underground workings; also a very fortunate thing for the deep-level work, as it would affect the mining costs very considerable. The hard quartzitic sandstone walls stand without either timber or filling being required, and only in a very few cases have any heavy falls of rock occurred in the now very extensive stopes. Prof. Agassiz, who visited the Rand in the early part of 1899, expressed the opinion that, after large areas of reef had been stoped out, or, say, in another five or ten years from now, extensive subsidences of the surface would take place, affecting the deep-level mines as well as the outcrop. Subsidences have already occurred in a couple of the outcrop mines, very close to the surface, and perhaps greater ones may yet occur in the outcrop area. But it is safe to say that this will only happen toward the end of the lives of the outcrop properties, and they can be readily foreseen and guarded against in such a manner that no valuable property on the surface need be damaged. That the surface of the deep-level areas will be seriously affected is, in my opinion, very doubtful, since the caving that may take place in these sedimentary strata will occur in the shape of falls of successive layers of rock, which will speedily fill up the worked-out area and uphold the remaining ground.

**WORKING COSTS.**—Unfortunately, I have not available here the official figures which would enable me to speak with accuracy, but one may say that, approximately, the working costs before the war were from 27 shillings to 28 shillings per ton, or, say, \$6.75 to \$7, while they are to-day about 2 shillings to 3 shillings per ton less, or, say, \$6.25 per ton. This, however, does not include the cost of obtaining Chinese laborers, which, I am given to understand, is very high. At the same time, the margin of profit is such and the scale of working is so great that these mines on the Rand are to-day paying out in dividends fully 30% of their total output; in fact, I have no doubt that this year they will exceed this proportion as they did in 1898, when the dividends paid were 32% of the total yield of £15,141,000, or nearly £5,000,000 paid out in dividends in one year.

**COAL.**—Some of the mines, especially those on the east sea flank, have both coal seams and gold reefs within their area. Coal mines have been developed in the immediate vicinity of Johannesburg, about 20 miles away, and also a higher grade coal, about 100 miles distant in the Middleburg district. This has enabled coal to be furnished to the mines at Johannesburg at an average price of \$3.50 a ton. At the western end of the Rand it sometimes runs up to \$4 and \$4.50; at the eastern end the price is nearer \$3. An electrical transmission plant was installed some ten years ago. It is a 20-mile transmission and a large plant with several 1500 H. P. units. It is built close to the coal mines, coal slack being used for fuel, the E. M. F. being 10,000 volts.

It has not replaced steam to any extent, however, on account of the cheapness of coal, and has been used chiefly as an accessory power in the cyanide and such lighter work, and for illuminating purposes in the town.

**DIAMOND MINING.**—There is little that I can tell you that is new about diamond mining in South Africa in view of the recent publication of an exhaustive treatise on the subject by that highest of authorities, Gardner Williams.

The first conception of a diamond mine in South Africa was that of an alluvial deposit, as the stones were found loose in the soil, and the laws were made on that basis. A claim was defined by law to be 30 feet square, and a man could take up but one claim only. It was soon found, however, that it was not an alluvial deposit, but a chimney or pipe in shape, more or less like an inverted truncated cone, on top of a cylinder. They finally struck at 500 or 600 feet depth the throat of the deposit, or the cylindrical portion, the area of which usually turned out to be anywhere from one-half to one-quarter the size of the

original area on the surface. Again, there was great confusion through one man working his 30-foot claim deeper than that of his neighbor, resulting in the ground caving upon him. Finally, from this and other causes, it became very clear that the deposit would have to be worked as a unit. They consolidated and formed the great De Beers mines of Kimberly, and then the work was laid out on a proper mining basis, with ample shafts sunk in the wall-rock, and open-work mining was stopped. Ever since, the mining has been carried on in that way, and to-day they handle several million loads per annum. At De Beers mine, the "load" is the unit of measurement, and is eight-tenths of a ton, or 16 cubic feet. The De Beers mine produces over £5,000,000 per annum and pays in dividends about £2,000,000, while it controls the diamond market of the world. Before the consolidation of the various owners of the claims, Kimberly considered itself ruined, because each one of the many diamond producers was throwing his product on the market and so breaking the price as to make diamond mining unprofitable. It, therefore, became very apparent that the diamond industry has to be handled as a unit, for financial reasons quite as well as for technical ones. Since that was done it has been remarkably successful. They are down now in the Kimberly mine, I think, something over 2000 feet, while the De Beers mine holds the record for rapid hoisting. In May, 1899, they hoisted at the De Beers mine 7409 tons from a depth of 1200 feet through two compartments with one engine, and since then they have beaten that record, which stands now at over 8000 tons hoisted in twenty-four hours by one engine through two compartments, from a depth of either 1400 or 1600 feet. As I am so far away from my main office I cannot give absolute figures.

As to the average yield of the diamond mines: I think the De Beers mine runs about 60 karats per 100 loads and the Kimberly about 75 karats per 100 loads, while the Premier, one of the famous mines, yields from 28 to 30 karats per 100 loads. But the Premier pays almost as well as the higher grade mines, because of the purity of its stones and the greater cheapness of working, it being still shallow and worked from the surface.

In the Transvaal they have discovered a diamond mine that is proving to be a very big one, namely, the Premier mine. Its area on the surface is a little over 3000 claims. The area of the Kimberly mine originally was something like 650 claims, and the area of the De Beers mine at Kimberly was in the neighborhood of 1400 claims, so this Premier diamond mine of the Transvaal has an area more than twice as big as the largest Kimberly mine.

As you know, the surface deposit, the top of the "pipe" or "chimney," is weathered, so that the material can be scraped up with scrapers and put at once into the pans. You can put up a hand-driven pan and get enough diamonds out of such a deposit to put up more elaborate machinery. Hence a diamond mine can be developed very rapidly and pay its way as it goes. This Premier mine is only two years old last month, and I have just extracted a few figures as to what has been accomplished there during that time:

YEAR ENDING OCTOBER 31, 1903.	
Washed.....	76,531 loads
Yield, at 27s 8d per karat.....	59,208 karats
Or, pounds sterling.....	137,435
Working costs.....	35,600
Profit, pounds sterling.....	101,835
YEAR ENDING OCTOBER 31, 1904.	
Washed.....	951,984 loads
Yield, at 27s per karat.....	653,040 karats
Or, pounds sterling.....	879,550
Working costs.....	154,697
Profit, pounds sterling.....	724,853

## The above results for 1904 give

Value.....	Per Karat.....	Value.....	Per Load.....
Expenses.....	27s 8d	Expenses.....	18s 5d
Profit.....	4s 9d	Profit.....	3s 3d
Or profit per karat.....	22s 3d	Or profit per load.....	15s 2d
Or profit per ton.....		Or profit per ton.....	\$5 50
Or profit per ton.....		Or profit per ton.....	3 70
Or profit per ton.....		Or profit per ton.....	4 60

These Premier diamonds do not bring as high a price as the Kimberly diamonds, which bring, I believe, about 42 shillings per karat. The run of stones in the Premier mine is not so good, as they average about 27 shillings per karat. The new plant now completed enables them to treat 110,000 loads, or 88,000 tons per month for the first nine months of the present year, and enlargements of plant now under way will permit of washing 200,000 loads, or 160,000 tons per month for the last three months of the year.

On the basis of the present yield of 75 karats per 100 loads, the present price of 27 shillings per karat and costs of 3 shillings per load, the profit for this year is estimated at £1,371,000 sterling.

This gives some idea of the rapidity with which a good diamond mine can be developed to even huge proportions.

On account of the surface dimensions of this weathered diamond-bearing rock, 3000 odd claims of 30 feet square each, they have so many million loads of ore in sight that they will not have to mine the "blue," or unweathered ground, through shafts for a good many years to come.

There is one interesting point in reference to diamond mining in the Transvaal, and that is the recently enacted diamond law. The government has taken 60% of every diamond mine discovered in the Transvaal, leaving the owners 40%. As a consequence of this profit of £1,371,375 which the Premier expects to make this coming year, the government will get £822,000.

This is a law that has been enacted since the advent of the new government and applies only to the Transvaal. The highest dividends paid by the gold mines was in 1898, amounting to £4,800,000. The government gold tax is 10% of the profits. This means £480,000 a year the government will get out of the Transvaal gold mines when they produce about £16,000,000 pounds as they did in 1898 and will do in 1904. Now, out of this single diamond mine, the Premier, last year, the government's share is £420,000, or almost as large an income as from all the gold mines of the country combined. I do not think it is too much to anticipate that inside of two years the income of the Transvaal government from this one diamond mine will far exceed the income of the 10% tax on profits from the entire gold mining industry.

In the matter of this 60%, the old law gave the discoverer of a diamond mine one-eighth of the area. That is to say, if a mine had 3000 claims he would be able to take one-eighth, or something near 400 claims. The public could then step in and locate all the additional area. In such case, however, they would have a repetition of the experience in Kimberly, namely, of breaking the diamond market again. The people would work this ground, which is easily washed, and the market would be flooded with diamonds. Therefore, the government took the attitude of saying: We will be the public to take these additional claims in order to prevent this disaster (and it was a great disaster in Kimberly, unquestionably), and we will satisfy the owners by giving them 40% of the mine instead of 12½%, reserving the balance for ourselves.

It was discussed for some time, a commission was appointed, and a number of us engineers were called before them to give technical advice. It was, however, finally passed that the government should have 60% of the diamond mine and of all future diamond discoveries. They allow the owners of the mine to deduct the cost of equipment, etc., and after that they share the profit. They thus prevent any flooding of the diamond market. It was pointed out by some of the witnesses before the commission that perhaps just as sound a way would be to give the owners the entire mine and let the government tax the output, the government to obtain in that way its necessary income. But that suggestion did not maintain, the law was finally passed and stands as described.

Unquestionably, the country has now gone through its most depressing period of reaction, such as follows every war. The labor difficulty having been satisfactorily solved, I look upon the future of the mining industry as very bright indeed. The gold product from now on will undoubtedly increase by leaps and bounds. I venture to predict that South Africa will head the list of gold-producing countries of the world next year and will retain that place for many years to come. Beside this great fact the minor difficulties just alluded to sink into insignificance.

## How to Set Up Wood Stave Tanks.

Written by R. STUART BROWNE.

The following interesting description of the methods of building and tearing down wood stave tanks is from the advance sheets of the new catalogue (now in press) of the Redwood Manufacturers' Co., 8 California St., San Francisco, Cal.:

First provide a substantial foundation. On this lay parallel sills from 12 to 24 inches apart, depending on the size of the tank, and cut so that they will come inside the chime without touching the staves. The staves must not be allowed to support any weight; consequently, the sills must be higher than that portion which projects below the bottom.

Lay the bottom on the sills, putting it together with dowel pins. The dowel pins are cut from the long round sticks, which are sent by the makers with the tanks. Each bottom plank is numbered and must be put in its proper place. When the bottom planks are unusually long, they are made in two or more pieces, the parts being joined together with iron tongues. After the bottom is laid, nail a cleat across it to hold it together, being careful not to drive the nails clear through the wood.

Drive the first stave in slightly at the crozing, the groove cut near the bottom of the stave, and stay it with a brace running from the top of the stave to the center of the tank bottom. Be careful in driving on the staves to use a block of wood between the staves and the hammer.

In putting up a tank, the most important thing to be observed is to put in a proper amount of stave material. The most frequent cause of leakage comes from making the tank too tight at the beginning. The redwood used in tanks is very dry, and when it takes up water it must have room to expand. If the



tank is too tight, the bottom planks will buckle and every joint will be strained. The secret of putting up a tank well is to know how to judge the amount of expansion in the wood. If not familiar with this class of work, be on the safe side and put the tank up so that the seams are not too tight. Each stave has boles bored for dowel-pins several inches from the top. This is of great assistance in bolding the staves in position while they are being set up.

It is very important that the hoops be placed on the tanks just where they are intended to be, and to make this easy the manufacturers have stenciled black lines across several of the staves. These staves should be distributed around the tank, in order that it may be seen plainly from every side just where each hoop goes.

In driving the staves on at the crozing, drive them on just as little as possible to have them hold, keeping them tight together, the object being to get as many staves on the bottom as possible. Rip and plane last stave to fill remaining space.

With the power of compression obtainable with round hoops, the staves can be compressed to almost any point desired after the bands are once around them. The top of the staves may overhang a little at the upper end for convenience in setting them up. After the staves are all on, they may be stayed temporarily with a rope, if in a windy place, using a stick to twist and tighten the rope; but in most cases it will not be necessary.

In putting the hoops on, begin at the bottom. To keep the hoop from slipping down while sections are being connected, drive short nails at intervals on the hoop lines to keep them in place until the hoop is drawn taut. This will not be necessary, however, if one man can be placed at each lug when a hoop is being put on. After the hoop is on, it is well to take a pencil and mark where one row of lugs should come. The lugs should be set in spiral rows around the tank, never having one lug immediately above another on the same stave. A spiral can be made very neatly by bending a thin strip of wood around the tank at an angle and then marking its position with a pencil. Where different lengths of rods are used in making up the hoops, be careful to get the same length of rod on the same side of tank, in order to make the lugs row up regularly. After the hoops are all on and drawn snug enough to hold them in place, one man should get on the inside of the tank with a mallet and block of wood and carefully drive flush any staves that show slightly sprung until the tank is nicely rounded. Should the staves spring back a little, tighten the bands.

Commence tightening the bands from the bottom up, working over each band until the top is reached. Do not try to draw too much at a time; the best results come from going over all the lugs several times, drawing each one a little. While one man is tightening up the hoops the first and second time, another should go around the tank with a bammer of, say, three or four pounds weight, striking the hoop firm blows every 3 or 4 inches, to help the band to bend in and get a good bearing. When a tank is finished, all the hoops should be drawn up equally tight. It is well to go over the hoops each day for two or three days, and it will be found that they can be tightened a little. In hot, severe climates this may be necessary occasionally, until the lumber in the tank has become as dry as the climate, and then the tank will remain tight.

**DIRECTIONS FOR TAKING DOWN AND RESETTNG TANKS.**—The taking down and resetting of an old tank is much more difficult than the setting of a new tank. First with a piece of chalk go around the tank and number the staves in the order in which they occur and likewise number the bottom planks. Then gradually loosen up the nuts on the hoops from top to bottom. Then, beginning with the top hoop, drop them off. Tie together portions comprising each hoop.

With a bammer, and block to protect the wood, knock off the last numbered stave from the inside down near the bottom. Nail a short cleat along the edge flush against stave No. 1, so that when the staves are put back the position of No. 1 can be readily determined. Now knock off the rest of the staves in regular order and tie them in bundles. One man should hold the stave while the second man is driving it out. Unless this is done the stave is apt to fall over and split off the chime.

Drive the bottom planks apart by means of a broad iron wedge, such as an ax bit, inserted in the cracks some distance from the rim. It is best to use two or three wedges, and they must be tapped very gently. The putting together of the bottom again is an easy matter. The getting in of all the staves without trimming the last one is the problem. If the last stave is trimmed, the tank is pretty sure to leak. The secret of getting in the last stave consists in putting the bottom together loosely, so that it has a larger circumference than when it was taken down. Therefore, leave some good-sized cracks in the bottom. Commence with stave No. 1, placing it against the cleat nailed along the edge, and follow with the other staves in regular order, making them fit as close as possible. If the work is done properly, the last stave will fit in. If it don't, the bottom must be spread until it does. Now replace the hoops; tighten up and the bottom and sides will draw together tightly as before.

## Place and Value of Small Scale Ore Tests.\*

Written by ERNEST H. SIMONDS.

The problems which confront the miner and producer of precious metals are more numerous and diversified, if not also more complex and difficult, than are the problems which confront most other classes of business men; and for their correct solution not only the results of scientific investigation, but, especially, the methods by which these results are obtained are of the greatest value. Progressiveness, an eagerness to investigate, a knowledge of the results of scientific progress and ability to make use of them are more valuable to anyone in our pursuit than in almost any other. The miner has the same problems of management as those of every business man, to which are added the problems of engineering; but, besides, he has to deal with problems of geological structure and of the metallurgical treatment of his ore, the correct solution of which is generally vital to the success of the whole enterprise; and one problem or the other is often more difficult to solve than any problem of engineering or of management. Moreover, if we seek the points in the management of a mine where the largest losses of profits are likely to occur, we shall find them, first, in the expense of useless dead work in developing the ore, and secondly, in preventable losses of values in the tailings. Here the largest economies are possible and here the largest successes are achieved. Again and again, a clear insight, not before obtained, into the manner of occurrence of ore bodies in relation to the surrounding rocks or of the condition of the valuable metals in the ore in relation to the other minerals present has turned failure into brilliant success.

The first requirement for the certain attainment of desired results is a complete and accurate knowledge of ascertainable facts, that is, full and accurate data. In order to make clear the place of small scale tests in obtaining data in relation to other methods of testing, let us first see what other methods are available.

There are three general methods of making ore tests which are used by different persons and under different conditions, each of which has both advantages and disadvantages. These three methods are:

1. By working a parcel of the ore in a mill of a neighboring mine.
2. By sending a carload or less of the ore to be worked to a metallurgical laboratory or testing works, accurate samples and weights being obtained of the ore and products of the test.
3. By making small scale tests in the laboratory, followed by the erection (before the entire plant is built, and the experimental operation at the mine, for as long as may be necessary to work out the precise details) of one complete unit.

Let us consider in some detail the advantages and disadvantages of each of the three methods.

1. The first method, by working in a local mill, is a cheap one, since the value extracted will help to pay for the work; and this method yields useful confirmatory results in cases where it turns out that the ore is similar to the other ores of a district which are being treated successfully. If sufficient ore is milled, as can easily be done in such a test, to get the plates into good condition and the machinery working well and to obtain enough bullion and concentrates so that unavoidable errors in the cleanup have only a small influence on results, the results may be quite conclusive. An instance of this was when one of the mills of the Jackson, Cal., district was used to test the ore of another mine a mile away, which was being reopened, before the latter's mill was built. But if it prove that the old mill is not adapted for treating the ore undergoing test, it may give little information as to what method may be used with success. For example, had the Black Oak ore, at Soulsbyville, Cal., been tested in a mill at Tuttletown, Cal., the owners would have learned simply that the ore was not free with coarse crushing and would have received little help towards working it with the high degree of success which they have now attained. Another circumstance adverse to the first method is that the local millmen are apt to be biased in favor of the method they are using and perhaps have little knowledge of methods used with varying ores and in other districts.

2. The second method, by working a carload or less at a testing works, has decided advantages over the first in that facilities will be provided for getting exact samples and weights and that the test probably will be conducted by men with a somewhat wide knowledge of methods of ore treatment; and in that the machinery will be provided with means of adjustment so that its operation can be more nearly suited to the particular ore. However, the rapid progress in methods and machinery for the treatment of gold and silver ores renders it impossible that any plant should be equipped with machinery for testing all methods or that its machinery will not before long get behind the times. Assuming, however, that the testing works is equipped with the machinery best adapted to the ore, the difficulties of

such tests are: First, the tendency is to send an insufficient amount of ore, or what is sent is not the average output of the mine, which the mill to be built later on will have to treat; secondly, that a considerable portion of the ore used for the test must have been milled before the machinery can be properly adjusted to enable nearly as good a recovery to be extracted as is possible; and, thirdly, a good deal of labor and care is required in a perfect cleanup—indeed, in tests by plate amalgamation, accuracy in the cleanup is practically impossible.

3. The third method, by making small scale tests in the laboratory, followed by the erection and experimental operation at the mine of only one complete unit of the plant, but this of full working size, has the disadvantages as compared with the first and second methods that the owners must go to the expense of the purchase of a unit of the plant, for its transportation to the mine and for its erection in working order there, before any of the ore has been actually treated on a working scale by the machinery intended to be employed. It has the further disadvantages that the mill will not be treating its full output so soon and that it will cost somewhat more to erect first one unit and later to erect the rest than to install the complete mill at once.

But the disadvantages of the third method, above enumerated, are heavily outweighed by its advantages, which are numerous and important. Assuming for the present what will be discussed later, that complete laboratory tests by competent men will correctly indicate the most advantageous process or combination of processes, for example, whether amalgamation, concentration, leaching or smelting, or a combination of two or more of these, is required, and what form of the one decided upon is best, whether the ore must be roasted, etc., it is possible, from the data of such tests, to erect at once at the mine a plant of full working size adapted to the ore, except perhaps as regards details, but so nearly the best possible plant that it can be made such by simple, inexpensive alterations which can be effected on the ground. The one-unit plant can then be used as a testing works, in the same way as would a neighboring mill or a general metallurgical laboratory, to determine with precision extractions, costs and details of operation and to expose in working any faults of mechanical construction, should they exist, so that they can be corrected in the one-unit and avoided in the complete mill to be erected later. Plans for the complete mill should be drawn before the unit is erected, and the unit built in accordance with them.

The one-unit plant, for purposes of testing, has all the advantages and none of the disadvantages of either a neighboring mill or a public ore-testing works and has other advantages peculiarly its own. Its advantages over other methods may be grouped under four heads: 1, ore supply; 2, modern machinery; 3, full working scale; 4, economic or business reasons.

1. There is an abundant supply of ore to be had for the cost of mining it; and conditions will enforce, or at least facilitate, the use of ore for test that correctly represents, in grade and in quality, the average character and the different phases of the ore from which the complete mill will later on be expected to obtain the highest extraction at the least expense and with the smallest investment of capital.

2. The machinery will be of a type best adapted to the ore, as indicated by the preceding laboratory tests, and it will be of the very latest design, since it is newly erected (the latter a condition of great importance in this day of the rapid evolution and improvement of metallurgical machinery), in respect, especially, of capacity and the accurate performance of the work in hand.

3. The process is not only adapted to the ore and the machinery up to date, but it is full working size, in fact, the complete mill will only be a multiplication of this single unit, thus testing the process and machinery mechanically and giving a chance for remedying any mechanical defects which may develop. Most testing works are equipped only with light machinery, and old mills have not the substantial construction and improved design to give large capacity, which in a great measure determines cost. With the unit plant right at the mine, tests of large tonnages extending over days or weeks can be made, thus rendering the small errors in the cleanup of slight effect on the results and giving exact data as to extractions, costs and even as to wear and tear; and the millmen have an opportunity to acquire skill in applying the method to the ore and in adjusting the machinery.

4. It enables the owners to realize on the ore taken from development workings with least expense and at once thus paying, at least in part, the cost of development; and the metallurgical development goes along with the mining development, problems of treating the ore are being solved at the same time as are those of finding and mining it. This is too frequently not done; no doubt you can call to mind at once, as I did within half a minute, from your own experience, three or four mines where ore of rich milling grade was proven in quantity several years before it could be worked to a reasonable extraction. Furthermore, if only one unit of the plant is erected at first, the temptation will be removed, in fact it will be impossible, to work through the mill (and

\*Trans. Cal. Min. Assn.



largely down the canyon or at least into the tailings pond, or perhaps into the treasury of the railroad company) the values in the rich ore usually taken from a new mine, before possible difficulties in its treatment have been gotten over. Such education is too expensive; it is cheaper to get it in a one-unit plant.

For all of these reasons, therefore, our final test can best be made in a one-unit plant at the mine. But in arriving at this conclusion, we have made one assumption, namely, that laboratory tests will correctly indicate the most advantageous process in a general way and with enough particularity so that we can install the machinery best adapted to the ore for the unit plant. We must, therefore, consider how far reliance may be placed upon the data obtained in small scale tests in directing us to the choice of the correct type of plant. How far are they reliable as preliminary tests? What are their faults? What their advantages?

(TO BE CONTINUED.)

### The "A" Frame Battery.

TO THE EDITOR:—I noticed an article in the *Mines and Minerals* some time since written by R. W. Barrell, E. M., which contained some very interesting data regarding the "A" battery frame for stamp mills, which he says first came under his observation in the early seventies at the Father De Smet mill in the Black Hills, and as I happen to know something of its origin, and how it probably reached that locality, I have thought fit to give an account of it.

The description of the construction of the "A" frame battery above referred to is as follows:

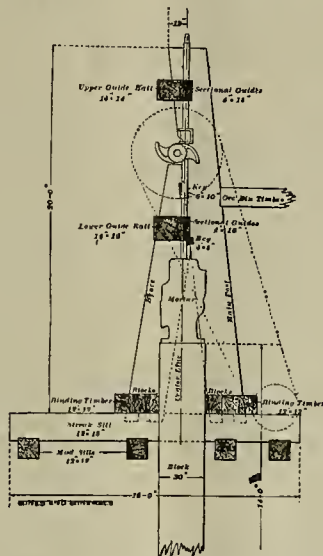
The mortar block, with mud and streak sills, are laid in a similar manner to those of the vertical post frame in general use about the country. In this particular case, the pit for the block was blasted out of rock for the last 8 feet of its depth. The size of the block put in was 4 feet 9 inches long by 30 inches wide by 14 feet in depth. We selected tamarack as being the best lumber in that part of Ontario, from which to obtain an even grade of 2-inch plank to satisfactorily withstand the jarring and vibration of the stamps, as well as lasting well in such a situation. After the 8-foot hole was blasted out a plank lining was put in, leaving enough width to give 6 inches of space on each side of the block. The space between the rough and ragged sides of the pit and the planking was then rammed full of strong concrete, the bottom of the pit being leveled up with the same material. After being left a sufficient length of time to allow the concrete to set, the plank lining was removed, which left a pit with smooth side walls 42 inches in width, or enough width to allow a space of 6 inches on each side of the 30-inch block. Two inches of clean dry sand were then put in the bottom of the pit and a framework of timber placed over the pit to hold the upper end of the block as each plank was put in place. After seeing that the end of a plank is square it is slid into the pit on end, one man being in the pit to place the lower end in position and one above the pit to keep the upper end in its correct place. As each plank is placed it is tapped down to settle the lower end firmly in the sand, and is then spiked to the plank against which it is placed, care being taken not to drive spikes where bolt holes will afterwards have to be bored. All joints of the planks should be broken, which is accomplished easily by using planks of several different widths. For instance, in building this 30-inch block, we used planks of the following widths: 12 inches, 10 inches, 9 inches, 8 inches and 6 inches. With these widths the requisite 30 inches of width was obtained by using two 12-inch and one 6-inch planks, three 10-inch planks, one 12-inch and two 9-inch planks, or three 8-inch and one 6-inch planks. Also by using these varying widths any size logs can be cut up economically. After the block is all spiked together and seen to be in its correct place, the 6-inch space around the block is carefully tamped full with clean sand.

The "mud" sills are now laid on each side of the block and lengthwise with it. In this case we use 12-inch by 12-inch pine laid on a foundation of cement. Four of these sills were used, one near each side of the block and one near each end of the 16-foot "streak" sill, which is placed upon them as shown in the drawing. These streak sills are placed closely against the ends of the battery block and bolted firmly to the mud sills, which together form a framework of timber about the block. The streak sills, in this instance, were yellow pine, 12-inch by 18-inch cross-section, 16 feet in length, which is about the average size of timbers used for this purpose. These streak sills are "gained" out 2 inches to receive the mud sills, and on top mortises are cut 8-inch by 8-inch by 6-inch in depth to receive two tenons on the end of each post and brace of the frame, as shown by dotted lines.

The main post has a height of 20 feet perpendicular from the top of the streak sill to the top of the post, and a total inclination of 30 inches in its length. The brace in front of the post has a total perpendicular height of 13 feet 7 inches, and a total inclination of 25 inches in its length. The brace and post are keyed together by two wooden keys, one 6-inch by 10-inch, and one 4-inch by 4-inch, as shown in the sketch, and are firmly bolted together with bolts. At the base of the posts and braces a binding timber is placed across the streak sills, and the space between them and the side of the block and between the two posts and braces at each end of every block are filled with short pieces of timber, shown in the sketch in end sections and marked blocks. These binding timbers and the braces and posts are then all bolted together by long bolts passing horizontally through all, after which the binding timbers are also bolted to the streak sills. This gives a very fine frame-

work about the battery block, as well as holding the post and brace firmly in place. The end posts and braces are 12-inch by 24-inch in cross-section, while the center post and brace of a group of batteries which receive the end of two cam shafts are made 20-inch by 24-inch in cross-section. If logs of large enough size cannot be obtained from which to saw such sized timber, they may be built up of two 12-inch by 12-inch and two 12-inch by 20-inch timbers, for the two different sized posts and braces required, firmly bolted and keyed together. These will give very nearly as good satisfaction as would one solid stick of timber.

A "gain" near the top of the brace receives the lower "guide rail," a timber 14-inch by 16-inch, shown in end section, and a gain near the top of the post receives the



The "A" Frame Battery Post.

upper guide rail, a 14-inch by 14-inch timber. These timbers are so framed together that they stand perpendicular, one above the other, and the inner side of them to be 4 inches from the center line of the stamp to receive the 4-inch guides for the stamp stems. The lower guide rail is bolted through brace and post to the frame, and the upper rail through the post, thus completing a very solid frame. The small circle at the back of the streak sill represents the driving pulley on the battery line shafting, and the large circle above the cam-shaft pulley. The line of the driving side of belt is shown by the arrowheads.

To steady the frame from behind, the timbers supporting the bottom of the ore bin are projected so as to reach the back of the battery posts opposite the top of the brace. This thoroughly takes up the horizontal pull due to the horizontal component of the pull of the belt.

I was superintendent of the Antelope S. M. Co. at Aurora, Nev., in 1864, and there first saw the "A" battery frame in the Fogus mill, which was built in 1863 under plans and supervision of a millwright by the name of Cutter, and I was so favorably impressed with its arrangement that I adopted it in building the 16-stamp mill of the Black Bear Co. in 1872, employing A. J. Rigby as millwright, who drew the plans by my instructions. In 1873 Mr. Rigby constructed an additional battery of sixteen stamps at the Black Bear mill, and a 32-stamp mill for the Klamath Company near here, both having the same style and giving good satisfaction. In 1876 or 1877 he went to the Black Hills, where he built the Caledonia mill, and according to Mr. Nesmith, who was in charge of one of the properties there, he was employed in the construction of the Father De Smet mill in some capacity.

My experience fully corroborates the indorsement given by Mr. Barrell, as the frame is compact and rigid, the belt strain is endwise of the battery posts, and the cam shaft boxes being also on the end of the timbers there is, therefore, less vibration.

The Fogus mill also was equipped with cams having a single horn, which, however, do not seem to have met with favor since.

Aurora at the time mentioned boasted of over 150 stamps—the Del Monte with 30, the Antelope and Wide West, each with 20, were all fine brick structures. The Del Monte in the seventies was moved to Bodie and became the Standard mill that produced many millions.

In the Antelope and Del Monte mills two 1500-pound stamps each were used, dropping 3 feet upon a die surrounded by grating, which served the purpose of the more modern rock breaker. It was at these mills that I first saw the gib tappet in use. T. Machell, the superintendent preceding me, claimed to have first introduced it. He was a miner and machinist of considerable experience in Tuolumne county, Cal., before coming to Aurora.

In 1860 I purchased of the Donahue Foundry, of which J. Brody was foreman, a 4-stamp mill, which, in company with others, I erected near here. The stems had key seats cut crosswise for the purpose of holding the tappet, but although better than set screws, which were first given a trial, the drop of the stamps could not be equalized readily. In 1862 I purchased of the same establishment a 12-stamp mill

for the Black Bear Co., of which I was then a member, and the stems had a flattened space for a distance of about a foot for a tappet key way. I mention these facts to show that up to July, 1862, the principal mining machinery establishment had not introduced the gib tappet, as well as to illustrate the progress of improvement in crushing appliances. Black Bear, Cal., April 14. JOHN DAGGETT.

### Gold Dredging in Oroville District, Cal.\*

NUMBER II.

Written by L. J. HOHL.

The Bucyrus boats, in some instances, have, right under the shaking screen, or under the tables, placed a distributing device which works very well toward getting the flow over the different tables regulated. The tables themselves are arranged in small units from 2 feet 6 inches to 3 feet wide, running at right angles to the drum or shaking screen, and are provided with arrangements to shut off the flow from any unit for the purpose of cleaning it up.

From these tables the material is carried off by longitudinal sluices, also provided with riffles, which deliver the material well back of the stern of the boat.

The Risdon boats use cocoa matting with expanded metal for a riffle, which needs a good deal of attention, but is claimed to be very effective.

The Pennsylvania boat, built by the Golden State & Miners' Iron Works of San Francisco, Cal., uses a nest of riffles in layers under the upper portion of the screen, a unique device, to which the name of beehive riffle has been given locally.

This boat also has a double screen, which separates the largest gravel from the finest before the ultimate screening is being accomplished.

The tailings are taken care of by the tailings stacker, or conveyor, at the stern of the boat. This conveyor consists of a long, inclined ladder, built out of structural shapes in various designs, supporting the chain of buckets or the endless belt for the carrying off of the tailings, together with the necessary appliances for driving and guiding the chain or the belt.

The Risdon stacker consists of a chain of light buckets; the other boats use endless rubber belts, both the chain and the belt being driven from the outer or upper end of the stacker in the latest type of boats.

The former appliance—that is, the chain of buckets—is said to cost but little for repairs, while the latter no doubt gives less occasion for shut-downs, but, as a belt will only last from six to nine months, costs a great deal for repairs. An experiment which has been tried on two of the dredgers in the district with fair success will probably ultimately solve the problem of repairs. It consists in running an independent belt of much smaller width, say 16 inches, in the center of the main troughing belt, thus exposing the smaller belt to the greatest wear and saving the main belt, which is from 28 to 32 inches in width.

A majority of the boats include in their equipment a sand pump for the purpose of pumping the surplus sand through a pipe running up along the stacker ladder and delivering it back of the tailings pile, thus keeping it from crowding in on the boat. This pump is a great power consumer, and, naturally, is only used in case of absolute necessity. In fairly deep ground it need never be used, except in the beginning, and even then it has been proved to be superfluous by recent developments; so that the time is not far off when the sand pump will be entirely discarded, except for such ground as contains very abnormal quantities of sand.

The power for the boats in the Oroville district is furnished by the Valley Counties Power Co. in the shape of three-phase A. C. at a voltage of 4000 to 5000, which is transformed either on shore or on the boat to 400 or 500 volts and then delivered to the different motors.

The cost of the power is 1½ cent per kilowatt hour.

The motor equipment of a typical 3-cubic-foot Risdon boat consists of the following: One 50 H. P. variable speed motor for bucket line, screen and stacker; 30 H. P. motor for water pump; 10 H. P. motor for winches.

The motor equipment of a 5-cubic-foot Risdon boat is: One 50 H. P. variable speed for main drive; 40 H. P. for water pump; 20 H. P. for drum and stacker; 10 H. P. variable speed for winches; 10 H. P. for ladder winch.

The motor equipment of a 3-cubic-foot Bucyrus boat is: One 50 H. P. variable speed for main drive; 20 H. P. variable speed for winches; 30 H. P. for water pump; 20 H. P. for stacker and screens; 30 H. P. for sand pump; 3 H. P. for auxiliary water supply.

The motor equipment for a 3-cubic-foot Bucyrus boat is: One 75 H. P. variable speed for main drive; 20 H. P. variable speed for winches; 20 H. P. for stacker; 15 H. P. for shaking screen; 50 H. P. for water pump; 40 H. P. for sand pump; 5 H. P. for auxiliary water supply.

The equipment of motors on the largest type Bucyrus boat built on the Yuba river is as follows: One

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100 H. P. variable speed for main drive; 50 H. P. for water pump; 50 H. P. for sand pump; 20 H. P. for stacker; 20 H. P. for shaker; 30 H. P. variable speed for winches; 7½ H. P. for auxiliary water supply.

The motor equipment on the new Marion boat at Oroville, built for the Boston & California Dredging Co. in conformity with their ideas and practices, developed by experience, is as follows: One 100 H. P. for bucket line; 30 H. P. variable speed for ladder hoist; 50 H. P. variable speed for main pump; 20 H. P. for screen and stacker; 20 H. P. variable speed for winches; 10 H. P. for auxiliary pump.

From data obtained at different times and from different sources the author has been enabled to give the following averages of the consumption of power on different boats for the various purposes:

Three-cubic-foot Bucyrus boat—Main drive, 26 H. P. to 45 H. P.; stacker and screener, 12 H. P. to 16 H. P.; water pump, 45 H. P. to 50 H. P.; winches (maximum), 28 H. P.; sand pump, 32 H. P. to 50 H. P.

Five-cubic-foot Bucyrus boat—Main drive, 42 H. P. to 70 H. P.; stacker and screen, 10 H. P. to 20 H. P.; water pump, 50 H. P. to 75 H. P.; winches (maximum), 27 H. P.; sand pump, not tested.

Five-cubic-foot Risdon boat—Main drive, 60 H. P.; water pump, 52 H. P.; screen and stacker, 18.5 H. P.; other motors not tested.

Yuba dredge—Main drive, 108 H. P.; water pump, 68 H. P.; sand pump, 63 H. P.; shaking screens, 11 H. P.; auxiliary water supply, 13 H. P.

The average running time of the boats varies a great deal in different months and under different circumstances. A new boat will be able to make better running time, as no serious breaks are likely to occur if it has been made strong enough in the first place. A breakdown of any magnitude, such as upper tumbler shaft, lower tumbler shaft or bucket line, will cut down the average running time. Where the boats are influenced by the stage of the water in the river, high water may seriously hamper them at certain seasons, and last winter was an exceptionally severe one in this respect, high water occurring as early as November, 1903, and being with us all through February and March of 1904. To show an extreme case, I have taken a selected year in the run of a boat exposed to the high water, so that the year contains all the high water of last season.

Besides high water troubles, the bucket line was in bad shape and broke frequently; the upper tumbler shaft broke twice during the period under consideration, the lower tumbler and its shaft had to be renewed, and also the conveyor belt, and, to cap the climax, the power was abnormally unsteady and unreliable during most of that year. The running time of the boat, figuring on the basis of 365 days in the year and twenty-four hours to the day, was sixteen hours out of twenty-four, or 66⅔%. It may seem odd to call particular attention to the fact that in this calculation the year is taken as having 365 days and each day to have twenty-four hours; but when you look over the records of some of the boats you will find that some of the stoppages are not counted on, such as high water, holidays, etc., the owner or manager arguing that the dredger should not be charged with any delays not originating on the dredger or its appurtenances. The simple fact that the dredger is not earning anything when it is stopped, whether such stoppage originates within or without the dredger, and which fact finds expression on the balance sheet of the company at the end of the year, is sufficient to show the fallacy of the assumption. Returning to the case under consideration, I append a tabulated statement, showing the causes for the different stoppages in per cents, as an indication of the weak points of that particular dredger during the selected period:

#### CAUSES OF STOPPAGES IN PER CENT.

Beltline.....	1.3
Bucket line.....	23.1
Lines breaking and changing.....	4.8
Cleaning up.....	1.7
Conveyor.....	5.3
Electric machinery.....	1.5
Frictions and winches.....	2.5
General repairs.....	1.7
High water.....	15.6
Holidays.....	1.8
Ladder and ladder hoist.....	1.3
Lower tumbler.....	8.3
Oiling.....	4.5
Power off.....	4.5
Shaking screen.....	4.5
Stones, roots and stumps.....	0.7
Upper tumbler.....	16.2
Water pump.....	1.4
Total.....	100.0

(TO BE CONTINUED.)

WHEN melting babbitt metal care must be taken not to overheat it, or the more easily melted constituents partly evaporate, leaving the alloy in bad condition. Melt a small part first and gradually add to it until all is melted. Then skim off the top and the metal is ready to pour. Before pouring the metal wrap a sheet of smooth writing paper around the shaft or other journal to be babbitted, and secure it by winding a string about it, spirally, in turns half an inch apart. Then place in the bearing and pour the metal. The paper keeps the cold iron from too quickly chilling the babbitt and gives it a smooth surface, while the grooves made by the string make good oil conduits. It will be found, if this is properly done, the journal will fit the bearing nicely and will require no scraping.

## Formation of Ore Bodies on Intersections.\*

NUMBER II.—CONCLUDED.

Written by MARK B. KERR.

When the writer was appointed general manager of the Grass Valley Exploration Company in Grass Valley, he was granted by the directors a free hand in development. Systematic exploration was immediately begun, as the reserves of milling ore then in sight were limited. A winze had been sunk some few feet in the hanging-wall of the drift. At this point (No. 1, Fig. 1) a cross slip on a joint plane intersecting the main vein at almost right angles was noted; by driving along about 200 feet on this joint or fracture plane, at another point of intersec-



Fig. 1.—Ore Deposit at Intersection of Seams.

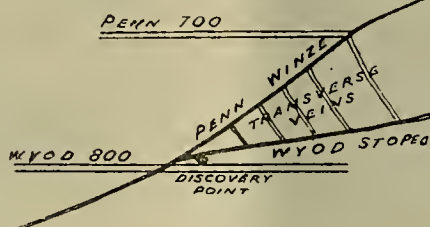


Fig. 2.

Jumper mine in Tuolumne county (the writer was in charge of this property for nearly three years). The Jumper fissure is composed of closely banded streaks of gray slate and schist, which contact in depth with streaks of grano-diorite and diabase of the same appearance as the wall rock of the Grass Valley veins. The grano-diorite and diabase is in the nature of a dike, and is of greatest extent on the north end of the property at the Golden Rule and is more in evidence in the upper than the lower levels. The fissure is noticeable for the limited quantity of the black Mariposa slate so plentiful in the Mother Lode fissures of Amador and Calaveras counties.

After careful study it was discovered that this closely banded strata of slate, grano-diorite, diabase and schist contained small transverse veinlets, the quartz being replaced by calcite. This is particularly evident on the 1000 north level (see Fig. 4), although the diabase is absent.

Near the surface and for several hundred feet in depth, these crossings were gold bearing, the latter being probably freed by oxidation, but were supposed to be a part of the vein, and enrich it considerably, the general strike of the vein being nearly true north and south and dip 65° to 75° E. Having settled the fact that the calcite seams were responsible for the coarse gold deposition characteristic of the mine, a systematic exploration was started to discover these enrichments in depth. At first, only

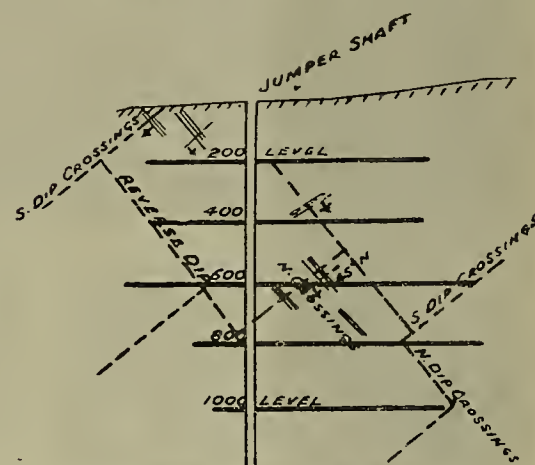


Fig. 3.—Crossings in Jumper Mine, Stent, Cal.

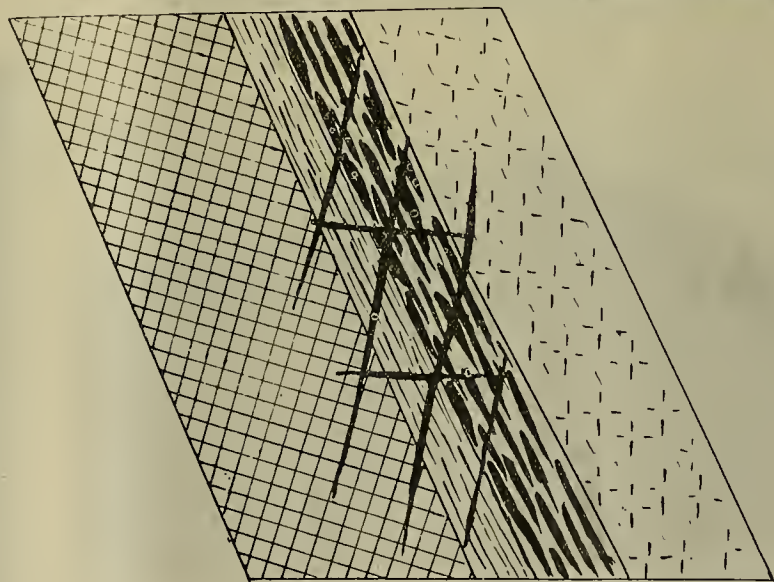


Fig. 4.—Occurrence in Jumper Mine, Stent, Cal.

tion (No. 2, Fig. 1) a new pay shoot was encountered. Afterwards, a raise was made from the bottom of the winze to discovery point No. 2, and a great deal of excellent milling ore taken out of this intersecting vein. Anyone interested in this exploration can find further details in the records of the Circuit Court of Northern District of California (Penn. Con. Min. Co. vs. Grass Valley Exploration Co.).

The legal rights of the possession of this ore body is one matter, but the fact remains that, by vigorous development in the legitimate pursuit of mining and as the practical miner would say, on our own foot-wall, we discovered an additional pay shoot of ore by following a joint plane in the granite.

In this stope transverse veins dipping east were noted, a cross-section of which will show the upward trend of ore deposition along transverse fracture veins. The adjacent country rock was seemingly mineralized only two or three feet beyond the wall of the fissures.

A somewhat parallel condition can be cited at the

one system of these calcite impregnations was found striking N. 40° to 50° E and dipping 30° to 50° N., but afterwards a second series striking the same but dipping to the south at a somewhat flatter angle were discovered; where intersections occurred either on the points or apices of these transverse veinlets or in corresponding troughs or depression, this enrichment with free gold was observed. Raises made on these calcite seams on angles from 30° to 50° proved that they followed the lines of fracture of the banded structure and passed through not alone the slate, but into the diabase and schist as well, the largest width of the crossing, 8 to 10 inches, being in the slate, while in the diorite or diabase the crossing was sometimes as small as a pencil line.

Taking the general form of the old stope ground (which was excavated mostly on the rake of the north dip crossings), and extending theoretical projection lines to the 1000-foot level, the supposed mathematical line of enrichment was found to strike farther north. This north 1000-foot level had been run in previous years over 600 feet without encountering pay rock. The level was extended

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only 10 feet through the closely banded strata of the vein when crossings of the south dip series were encountered carrying free gold, a fact proving the theory of ascending gold-bearing solutions, depositing free gold within the calcite crossings, these crossings being parallel to the lines of fracture and joint planes of the country rock. One point of geological interest was noted. In the slates, diabase and schists, quartz was replaced by calcite, while in the grano-diorite the crossings were composed of quartz.

In looking at Fig. 3, a most homely illustration occurs to me. If you take an ordinary set of Japanese boxes, one within the other, and gradually unnest them, the last inside box will preserve the same form as the first and largest one. So with the form of the Jumper ore body. As seen on the diagram, the main pay shoot is in the form of a large parallelogram outlined along the massive structure; reduce this to an intersection of two series of gold-bearing crossings and the form becomes a rhombohedron. Again, take a good-sized crystal from the same inter-

## The Strength and Life of Mine Timbers.\*

NUMBER II.

Written by W. H. STORMS.

Believing that valuable information could be obtained by addressing some of the other members of this Association, I sent out the following inquiries. Please state:

1. The kind of timber employed; that is, whether yellow or sugar pine, spruce, fir, Oregon pine, etc.
2. Its condition at the time of going into the mine, whether well seasoned or not.
3. Its position in mine with reference to excavations; that is whether in stope, drift or shaft, and its relation to air currents, as there seems to be considerable difference with reference to the enduring qualities of a stick of timber, dependent on its location, whether in still air or in a current of considerable velocity; and also whether the air current is compar-

Grass Valley, Cal., who thus briefly but carefully answers the questions:

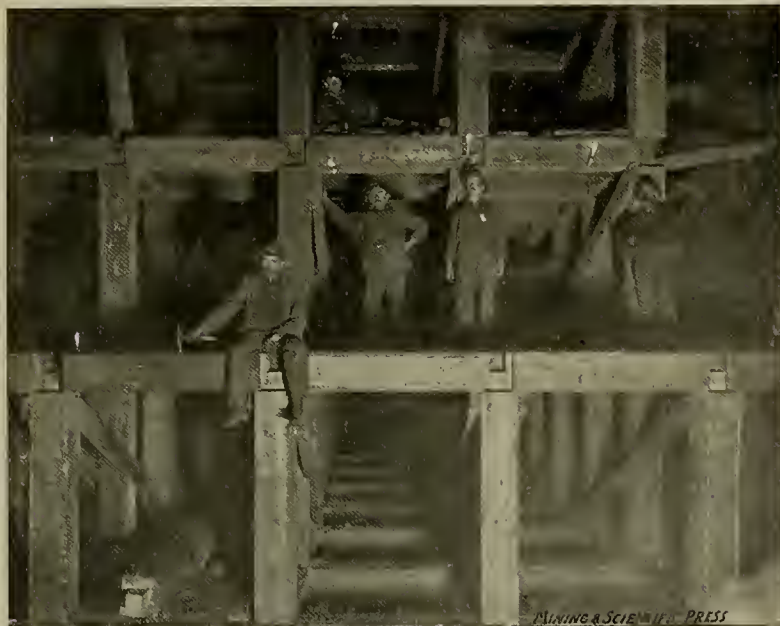
- No. 1. Yellow pine and spruce.
- No. 2. Used after being cut about eight months.
- No. 3. We use yellow pine in stopes, and in places where not much life of timber is required, and spruce timbers is used in drifts and drain tunnels.
- No. 4. Stopes are usually damp and fungus forms on timbers after six months.

No. 5. A, spruce, wet ground where water is trickling over constantly will last indefinitely, but in damp ground about three to five years; b, yellow pine about two years.

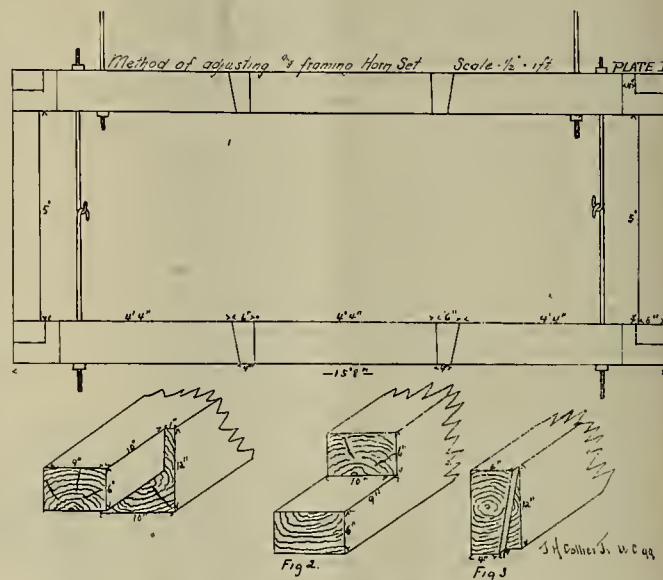
No. 6. Spruce.

The Empire mines in granite, the veins for most part have a low dip, and the type of vein formation is entirely unlike that found on the Mother Lode.

John Ross, Jr., for many years superintendent of large mining interests in Amador county, Cal., and elsewhere, kindly contributes the following:



A Stope Timbered in Square Sets.



Side View of Shaft Set.



Mine Timbers Piled Up for Winter's Use.



Hauling Mine Timbers from the Forest.

section and fracture it with a hammer. In its smallest fragment the same form and fracture will be observed. For further details of this fracture and joint plane theory, see testimony of Louis Janin in Penn. Co. vs. Grass Valley Exploration Co.

Now, apply these practical remarks to ore bodies and we can outline a definite line of exploration. First—Solutions of ascending waters will by metasomatic processes be deposited more frequently on the fracture seams of the vein. Second—After the definite strike and dip is obtained of the fracture seams, the enrichments are more liable to occur on these lines mathematically projected at other points.

An earthy charcoal sometimes found in eruptive rocks is due in some cases to pieces of coal detached from beds through which the eruptive rock has forced its way. In other instances it is due to wood becoming inclosed in the rock. The latter has been known to occur with volcanic rocks, such as andesite, though the former may occur with non-effusive rocks, like felsite, diorite, etc.

atively pure, fresh air, or whether heavily laden with carbon dioxide and other foul gases peculiar to mines.

4. The condition of moisture of the air; is the stope damp? Does fungus form rapidly on the timbers, or is it comparatively dry and free from these formations?

5. How long, in your experience, should a stick of timber, say 20 to 30 inches, endure under average conditions, in a well ventilated drift, in a damp mine (a, spruce; b, yellow pine; c, sugar pine; d, fir; e, redwood)?

6. What, in your opinion, is the best timber for all-around underground use in mines? Have you ever noticed any material difference in the various kinds of timber, of equally good condition; that is, well seasoned sticks?

To this letter I received a number of replies, the answers in most instances agreeing, not only with my own experience, but with each other.

The first response was received from George W. Starr, managing director of the Empire mines at

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“Regarding the strength and durability of timber in mines:

1. Oak, spruce, yellow pine, Douglas spruce (commonly called Oregon pine), bull pine, sugar pine, native fir.

NOTE.—Oak is rarely used, on account of its scarcity, but I know a shaft that was sunk in '59 and '60 and kept open for seven years—part of the shaft was timbered with oak. The mine then laid idle for twenty years, the shaft being full of water. It was reopened in '87, and has been kept open until the present time. The oak timbers stood until 1901, and at that time the wall plates and sills were in perfect condition, and would not have been changed but for the fact that the pressure on the end timbers—or legs—had been great enough to crush the ends a little, making them too short to be used again. This shaft is an incline, and a little water was continually trickling over the timbers—enough to keep them thoroughly wet all the time. Under the same conditions a few sets of timber made of hull pine also stood in the same shaft for forty years, while spruce, yellow pine, Oregon pine and fir had to be changed several times, the timber lasting in the order given, and its life in the shaft being from two to eight years, where the



timbers were always wet. But in other parts of the shaft where the timbers are wet and dry alternately the life of the timber ranges from one to three years. This shaft, however, is an exceptionally hard one on timbers, being sunk on the vein fissure and in the "gouge," and the pressure on the timbers is not equal. In justice to the other members of the timber family, it is but fair to say that the oak and bull pine were used in the narrowest part of the vein, where the pressure was not so great as where the gouge was wider.

2. The condition of the timbers going into the mine varies from green, "fresh from the axe," to thoroughly seasoned—that is, timber that has been cut for two years. Where the timbers are sound when going into the mine and they are placed where water trickles over them, there is practically no difference in the life of a seasoned timber or a green one, but in a dry or a damp drift the seasoned timber is preferable, partly on account of less cost in handling and putting in place, and furthermore, it is not so quickly attacked by the fungus growth or "dry rot."

NOTE.—I have seen great timbers placed in a damp drift attacked with fungus growth within about two weeks of the time it was put in place, but this is not common.

3. The position of the timbers in the mine relative to air currents and the purity of the air has more to do with its life, in my opinion, than any other thing.

NOTE.—In making a connection between two shafts, 1000 feet apart, work was commenced from each shaft, the air being forced down each shaft to the face of each drift, giving plenty of good air for the workmen. The work was not rushed, taking about a year's time. During this time the timbers stood well, showing no sign of "dry rot" or fungus growth. When the connection was made the air came through the drift with considerable velocity, making one shaft a "downcast" and the other an "upcast." Near the downcast shaft the drift and stope was 30 feet wide, and heavily timbered. These timbers stood for six years with practically no repairs. Between this place and the upcast shaft the drift was opened out to a width of from 20 to 30 feet in a number of places in stoping, the drift proper being kept as straight as possible, and through which the most of the air came. It was quickly noted that the farther we got from the downcast shaft the worse the conditions of the timbers became—they being attacked with fungus growth and "dry rot." It was also noted that where the drift had been widened for stoping purposes the timbers that were out of the direct current of air were not so quickly attacked, and experience afterward showed that they would last twice as long. The life of timbers that were in direct line with the air current was from one to two years, and when not fairly in the current from two to four years. It was also noted that the timbers in the upcast shaft above the point of connection soon became seriously affected, necessitating considerable repair work. As the property became more developed this experience was duplicated in three different levels.

Another instance proving the above may be mentioned: We are now opening out a caved portion of one of these connecting levels where the drift proper had been retimbered three times before it caved. In our work now we find the drift timbers to be little more than punk, while the stope timbers that came down with caving of the drift are as sound as when placed in position. These stope timbers did not come into direct contact with the air current. Many of these stope timbers had been in place at least three or four years longer than those in the drift.

4. Warm, moist air in a mine that has but one shaft is far more destructive on timber than dry and comparatively cool air. In the latter instance the timber will last at least twice as long.

5. A, spruce, about six years.
- B, yellow pine, about five years.
- C, sugar pine, about four years.
- D, fir, about two years.
- E, redwood, never used any.
6. For all round work, spruce.

NOTE.—At one time a comparative test was made at this property in a raise where the ground was very heavy. Oregon pine, 12x12 inch, was used on one side, and 14 inch round native yellow pine on the other. In one year the round yellow pine stick was badly bent and twisted, and the legs were forced into the wall plate 3 inches, but there was still strength left in the timber to hold the ground, while the 12x12 sawed timber Oregon pine was shattered into slivers, and could bear no further pressure. None of the timbers used in this test showed any rot or fungous growth.

To G. McM. Ross, a mine superintendent and manager, whose experience in California, Arizona, Nevada and elsewhere I consider of great interest, I am indebted for the following:

1. I have used many kinds of timber in various conditions, from green, wet wood, fresh from the sawmill pond, to old telegraph poles, railroad ties, sagebrush, and the juniper of Nevada, also the fiber of the tall cactus of Arizona.

The above answers your second question.

3. Any timber will last longer in a stope or drift that is well ventilated with fresh, pure air than where there is a limited supply of fresh air, or none at all.

4. Timber of any kind will last longer underground when wet, or when there is sufficient moisture in the ground or air to keep it damp. Fungus will not form on timbers where there is a good circulation of pure air, but will and does form rapidly where there is little or no air. In parenthesis I would like to suggest to you, what I have to others, that in my judgment there is a pretty intimate relation between the

fungoid growth on timbers and the phases of miners' so-called consumption. We have never succeeded in having the question looked into in the proper light, or the necessary investigation made.

In answer to your fifth question will say that it is impossible to figure on an average condition. We have seen large timbers crushed into slivers in a few days underground, and again have seen timbers of the same size perfectly sound after being underground for forty years. Spruce, yellow pine, fir or cedar, in a well-ventilated damp mine, where there is no excessive pressure, should last for fifty years. Sugar pine, which is the very best timber that we have, is now too valuable for mining purposes, and redwood is not fit for mining work in heavy ground.

6. Any available sound pine, thoroughly seasoned, is the best timber for all around mining work. Timber that will best resist an end-thrust is the most serviceable for mining work.

In the matter of preservation of timber for underground work no preservative containing a fluid that can be rendered volatile, or emit a gas, can be safely used. We have never found a timber, with the exception of sugar pine (and, as previously stated, this is now too valuable), that would resist the action of the soil or surface dirt. It commences to rot practically as soon as it touches the ground, so that in the construction of mining buildings, shaft houses, ore bins, etc., no timber that is to take weight should be placed upon the ground, but should set upon a foundation of brick, stone or concrete.

Ten years is a long life to give to the mudsills of any building that are not kept thoroughly wet. Shaft timbers, regardless of the character or kind of wood, should be kept wet, and selected so as to offer the greatest resistance to end-thrusts.

In repairing shafts we have often had timbers taken out with perfectly sound centers, the ends of the sticks being splintered by pressure and then rotted by being kept wet for only part of the time. In dry, hot mines, such as the Comstock, a great deal of timber loses all of its strength by a slow process of distillation, the residues being of brownish color, and in many cases no heavier than punk.

While the use of timber is absolutely necessary in nearly all mining work, there has been beyond question a wanton waste of magnificent timber. Effort should be made to develop systems in which a minimum quantity of timber is required. Stopes of large size should be filled, and in every possible way the timber taken underground should be reduced to a minimum.

(TO BE CONTINUED.)

## THE PROSPECTOR.

Those sending rocks, ores or minerals for determination are requested to send name and address plainly written, so that in the event of a personal letter becoming necessary the sender of such samples may be reached. Some packages are sent with no other name than "Subscriber," and as the MINING AND SCIENTIFIC PRESS has thousands of subscribers who are scattered in every corner of the world it is impossible to know who the correspondent is. It is also desired that rocks, minerals and ores be sent, whenever practicable, in mass, and not pulverized. It is not the intention of "The Prospector" to make assays or analytical tests, but to simply aid the prospector by telling him as clearly as possible the character of his minerals, ores and rocks, that he may the more intelligently pursue his investigations in the field.

The rocks and minerals from Quartzsite, Ariz., are: No. 1, fine-grained mica schist. No. 2, talc schist, with crystals of limonite pseudomorph after pyrite. No. 3, talc schist, same as No. 2. No. 4, quartzite. No. 5, quartzite. Nos. 6 and 7, sandstone. No. 8, a dense quartzite, with a little secondary mica in the jointing planes. No. 9, dense quartzite, from an outcrop. No. 10, quartzite, with limonite and a little copper carbonate—the small pieces are mostly iron oxide, copper carbonate and silica. No. 11, chalcocite (copper glance). No. 12, copper glance, with much impurity, principally iron oxide. No. 13, grains of quartz, with many groups of the talcose mineral called pyrophyllite. No. 14, quartzite, with a scabiose structure, induced by pressure. No. 15, also quartzite. The rocks are all of sedimentary origin, but all metamorphosed, with the exception of Nos. 6 and 7, which are sandstone and metamorphosed but little if any. The rock containing pyrophyllite is probably the result of contact metamorphism. The best ore is No. 11, and should be shipped at a good profit if sufficient of the ore is available.

Tests for the presence of gold in rock, when none can be obtained by panning, are too delicate for the prospector in the field. Tests for silver may be more easily made, however, by dissolving some of the mineral in nitric acid, diluting the solution with water and adding a few drops of hydrochloric acid, or of a solution of common salt. If silver be present in any appreciable amount it will be precipitated as white chloride of silver. Unfortunately this test will not

do for silver chloride, as it is not soluble in nitric acid, and this is the ore the prospector is most likely to find in his search, as it most commonly occurs in the surface outcrop of silver veins. A solution of hyposulphite of soda dissolves silver chloride, and is precipitated by sodium or calcium sulphide, made by boiling lime or soda with sulphur. A few drops of either of these will cause any silver to be precipitated as the black sulphide of silver. Copper, lead and manganese are also precipitated by these sulphides, each having a distinctive color, with which the prospector must familiarize himself.

The samples from Callahans, Cal., are: No. 1 is chalcopryite (copper sulphide) in quartz, brown iron oxide and a little blue carbonate of copper present. No. 2 is mostly dolomite (lime magnesia carbonate), with a little ankerite appearing in light brown patches. This rock contains iron sulphide and probably also gold.

The mineral samples from Columbia, Goldfield mining district, Nevada, are: No. 1, from Eugene No. 4, rhyolite tuff. No. 2, from gulch north of Eugene group, pumice (a volcanic product). No. 3, also pumice. In time, with low transportation charges, these materials may become of economic value, but situated as they are at present are commercially worthless.

The minerals from Denio, Or., are: No. 1, an ore consisting of red oxide of copper (cuprite), green carbonate of copper (malachite), and blue carbonate of copper (azurite). The gangue mineral is fine, granular quartz. There is also present in this little ore specimen jasper, iron oxide, manganese oxide, a little copper glance (chalcocite), magnetite, pyrite, chalcopryite and kaolinized feldspar. All of the copper minerals present are due to the oxidation of chalcopryite, except the chalcopryite itself. No. 2 is jasperoid (silica), with a few specks of cinnabar (mercury sulphide). No. 3 is a metamorphic rock, probably occurring at or near a granite contact. The principal minerals visible are quartz, feldspar, biotite and muscovite, garnets and fluor spar.

The mineral marked 44 Rio Dolores M. Co., Rico, Colo., is principally lead sulphide (galena), the bright, crystallized, lead-colored mineral, and zinc sulphide (sphalerite), the dull-gray, fine-grained mineral. There is a small amount of iron sulphide also present. The white gangue mineral is carbonate of lime. This ore treated by magnetic separator will yield a lead and a zinc product.

The rocks from Lundy, Cal., appear to be volcanic mud, indurated, and carrying a large amount of finely disseminated magnetite. The smooth, polished surfaces are due to movement of fragments of the rocks upon themselves. There is also considerable pyrite along the edges of the rock.

The minerals and rocks from Shoup, Idaho, are: No. 1, pyrite, galena and zinc blende in a quartz gangue. No. 2, a dolomitic mineral in which there is a little galena. No. 3, quartz diorite in which there is a little disseminated chalcopryite. No. 4 is apparently diabase, but is much altered—what was evidently originally olivine is now altered to serpentine.

The mineral samples from Seattle, Wash., and marked "cyclopean," are determined as follows: No. 1, chalcopryite (copper-iron sulphide), with a little quartz and other vein material partly feldspathic. No. 2 same as No. 1, with less gangue mineral. No. 3, chalcopryite with disseminated crystals of tourmaline. Nos. 4 and 5 are stibnite (antimony sulphide).

The rock samples from Fort Jones, Cal., are of interest. The black rock is evidently a metamorphosed clay rock, now silicified and impregnated with pyrite. It resembles some black aphanitic diorite, but it shows no sign of the characteristic crystalline structure of diorite, and there are no magnetite grains, so abundant generally in diorite. The gray rock is felsite, an intrusive dike rock, sometimes forming large mountain masses. It shows abundant round inclusions, which indicate that the rock at one time was more glassy than at present, and these spherules are the remnants of its former perlitic structure. It has also been silicified somewhat.

For good drainage a tunnel should have a grade of at least 2.5 inches in 100 feet, and 4 or 5 inches is better. If a very low grade be given the tunnel should be provided with a drain box, either beneath the track or at one side, which must be kept clear of debris. Sometimes only one part of a tunnel, drift or crosscut makes all the water, the balance being dry. In the event that this wet portion is a long way from the mouth of the tunnel or the shaft it is a good idea to construct a small reservoir to collect the water which may then be carried out in a pipe, keeping the remainder of the tunnel dry and possibly permitting some advantageous use of the water, such as driving a fan or air blast, or running a small water wheel for some purpose. The efficiency of this scheme depends upon the volume of water in the tunnel and the head at which it may be applied outside the tunnel.

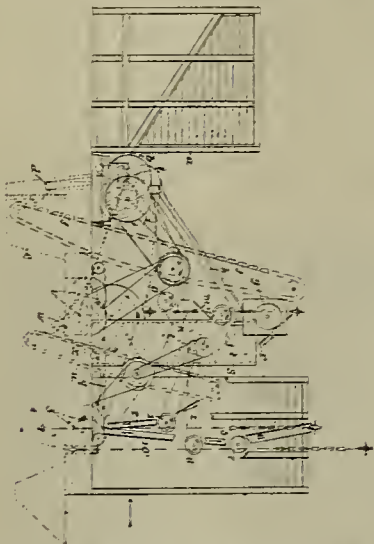


# Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 11, 1905.

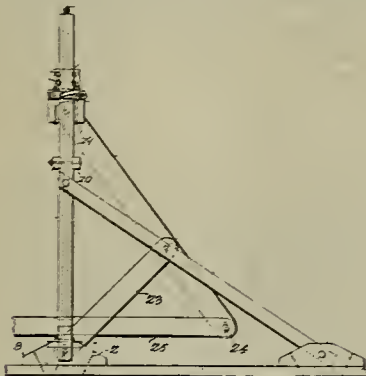
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

PROCESS OF TREATING ORE.—No. 786,570; E. Kelly, Dover, and A. Munson, Hibernia, N. J.



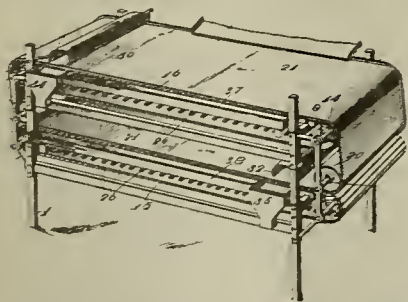
Process of treating ore bearing magnetic substance which consists in first separating ore of given size from ore, or fines, of less size, drying ore of less size, subjecting ore of larger size to action of magnetic separator having given strength whereby to separate out, as heads, all ore having given percentage of magnetite from that, as tails, having less, and then reducing tails and subjecting them, reduced, and fines, to further magnetic separation.

PUMPING JACK FOR OIL WELLS.—No. 786,854; R. G. Strother, Findlay, Ohio.



In device of class described, base having plurality of spaced blocks disposed in two sets in alignment with each other, uprights mounted between and extending upwardly from outer blocks, inclined braces for uprights, abutments secured upon latter, crosshead engaging uprights and moving vertically upon latter, spaced blocks arranged in pairs upon under side of crosshead, operating levers pivotally connected with blocks, auxiliary levers connected with operating levers intermediate ends of latter by means of transverse rods, pivotal connecting means between lower ends of auxiliary levers and base blocks, operating bars, and transverse rod connecting latter with free ends of operating levers.

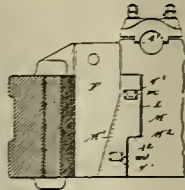
ORE CONCENTRATOR.—No. 786,799, P. H. Craven, Rossland, Canada.



In ore concentrator combination with frame thereof, of endless belt suitably mounted for rotation to carry its upper and lower sides in opposite direction, belt being transversely inclined, troughs for discharging material upon upper surfaces of upper and

lower sides of endless belt, traps secured in position above surfaces of upper and lower sides of endless belts in form of inverted troughs, inner edges of traps being slightly raised above surfaces, and outer edges in contact therewith, longitudinal troughs along lower edges of two tables formed by endless belt, funnel shaped hoppers at lower ends of traps, and means for discharging suitable sprays transversely through traps.

ROCK CRUSHER.—No. 787,322; E. C. Bacon, New York, N. Y.



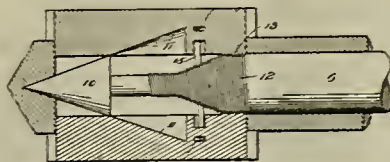
Auxiliary cheek piece having shoulder, in combination with crusher frame recessed to receive cheek piece and support it by shoulder, and with fixed jaw, movable jaw and cheek plates, latter supported and held in place by cheek pieces and fixed jaw, and means for adjusting cheek piece directly laterally toward and from adjacent cheek plate.

STAMP STEM GUIDE.—No. 786,969; F. W. Hooper, Grass Valley, Cal.



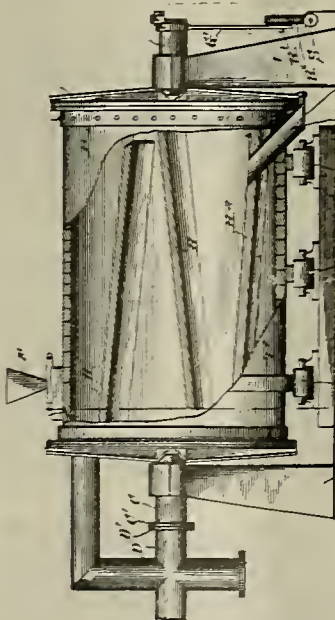
Stamp stem guide comprising casting having means of attachment with battery frame and provided with socket substantially rectangular in cross-section, back and front walls of socket being straight and side walls converging downwardly, socket having passage through front wall for lateral admission or removal of stamp stem, and sectional guide block or box fitting socket, sections of guide block formed with opposed abutting edges oppositely inclined relative to each other and to axis of bore.

ROCK DRILL BIT.—No. 786,952; S. B. Clark, Denver, Colo.



Expanding bit for drills comprising hollow shaft having lateral openings formed therein, laterally moving elongated cutters mounted in openings and extending longitudinally of shaft, and rotating wedges interposed between cutters for separating them with parallel movement and supporting them in cutting position.

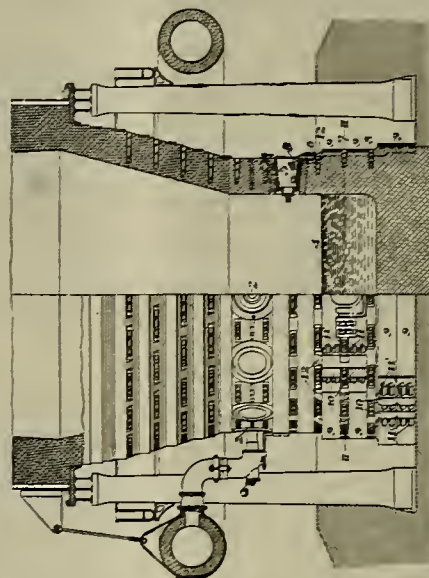
ORE ROASTING FURNACE.—No. 786,905; A. C. Johnson, Baltimore, Md.



Rocking ore-roasting furnace or drier having series of shelves, upper surfaces of which are convex, axes of which shelves are at angles to one another and lengthwise of furnace, alternate ends of shelves being free, and means for rocking furnace.

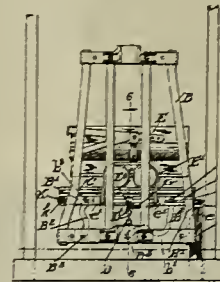
other and lengthwise of furnace, alternate ends of shelves being free, and means for rocking furnace.

MEANS FOR PROTECTING BLAST FURNACE HEARTHS.—No. 787,282; C. E. Dinkey and H. A. Brassert, North Braddock, Pa.



Blast furnace having hearth wall provided with circular rows of separated holes extending horizontally and inwardly from outer vertically extending face below level of cinder notch, and water-cooled plates arranged in series in holes, outer vertically extending face of masonry wall being exposed and accessible between sides of plates, and separated horizontal retaining bands between rows, hearth wall being free from any inclosing jacket.

MINER'S DUMPING CAGE.—No. 787,189; J. Kerst, Springfield, Ill.



In apparatus of class described, combination of cage, tilting platform mounted on cage, oscillative shafts on platform, lever connected with one of shafts, stop with which lever engages, keepers on shafts adapted to fit around wheels of car, arms secured to shafts, and lever mounted on platform and connected with arms.

MINERAL VANNER.—No. 787,190; H. C. Krause, Point Mills, Mich.

Vanner, consisting of bed, inclined pan, two pairs of arms pivoted to bed and to pan, means for adjusting one pair of arms to give more or less inclination to pan, means for vibrating pan, water supply at upper end of pan, and horizontal sifter of less length than pan and supported by and above pan at about midway between ends thereof, sifter having apertured distributing plate arranged therein above sieve and terminating short of ends thereof and provided with laterally extending chute at end adjacent to upper end of pan.

MATERIAL FOR FURNACE LININGS.—No. 785,841; H. G. Turner, London, England.

Process of heating magnesite in electric furnace at temperature of electric arc to point where material crystallizes, cooling resulting product, grinding same, mixing it with suitable binding material which will harden and cause material to set, mixing same with water and pressing it into form of bricks or plates and baking bricks or plates in suitable kiln.

In the Klondike region more than \$200,000 has been expended in ditch construction during 1904, with a view to hydraulicking the coming summer. Although wages for miners are \$5 per day with board, the mine operators have been unable to secure the necessary men to work their mines to their full capacity, probably owing to the fact that the men find it more profitable to work for themselves, or prefer prospecting to working for wages, not an unusual thing in a placer country where the inducements and opportunities are as abundant as in the Yukon basin.



# MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

## ALASKA.

(Special Correspondence).—J. Capperton of Eldorado Creek says that before the wagon road was built from Dawson to Grand Forks the cost of transportation was 25 cents per pound by pack train in summer and 12½ cents per pound in winter on runners. Now with roads charges are ½ cent per pound on wheels in summer and 1 cent per pound on runners in winter. The development of this country has been greatly retarded by blanket locations by those invested with power of attorney, but the bona fide prospectors and miners are making efforts to have this abolished.

Eldorado Creek, April 2.

There are in the Yukon-Tanana country four regions which are producing placer gold—the Forty-Mile region, the Birch Creek region, the Rampart region and the Fairbanks region. The Forty-Mile and Birch Creek districts are among the oldest of the gold-placer producers of Alaska, they are by no means exhausted, and with the introduction of improved methods of mining will continue to yield good returns. It is too soon to predict the future of the newly discovered Fairbanks placers, but they show every evidence of profit if mined by improved methods. The placers are near water transportation on the Tanana, and machinery can be put in at much less cost than at some of the older camps.

Superintendent Hoggatt, of the Jualin mine, near Juneau, is opening the property. The summer will be spent on development work and it is not probable that the mill will be in operation until late in the fall. Superintendent G. Ottorson is opening the Mansfield Co.'s mine, near Juneau.—The Alaska-Juneau property in Silver Bow basin will work a full crew this season.—The Sheep Creek Co. will put on a full crew this month. Superintendent Hammond expects to have all the stamps dropping this summer.—A dredger will be put in below the Mendonhall glacier by a Seattle company.

C. S. Carter of the Rainbow Creek M. Co. is working fifteen men near Seward. He will also run a dredger on Resurrection creek, 4 miles from Seward.—The Ready Bullion mine on Lynx creek is to be worked by N. P. White of Sunrise.

## ARIZONA.

### Cochise County.

(Special Correspondence).—The Calumet & Arizona mine has men at work on the new 200-foot steel stack and 50 feet of it has been completed. The widening of the converter building has been started and it will be 15 feet wider when the work is completed. Two new electric cranes are being put in. The new steel boiler house will have a battery of seven boilers, five 250 H. P. and two 280 H. P. The output at the Calumet & Arizona during March was 2,691,599 pounds of blister copper.

Bisbee, April 17.

W. K. Maull has an option on 125,000 tons of tailings on the San Pedro river, 9 miles from Tombstone. These tailings are from the ores of the old Tombstone mines and average \$4.50 to \$5 per ton in gold and silver. The company expects to build a 200-ton per day plant.—The Manhattan Development Co. has been organized by Lake Superior, Mich., mon, with a capital stock of \$200,000, to bond and lease claims in the Chiricahua mountains, near San Simon. J. H. Rice of Houghton, Mich., is president and W. G. Rice secretary and treasurer.

The report of the Calumet & Arizona M. Co. at Bisbee for 1904 shows that they produced 15,819 tons of refined copper and \$195,926.18 in fine gold and silver. The average number of men employed at the mines was 583 and at the smelter 301. The Oliver shaft is down 1132 feet and the Irish Mag 1250 feet and are connected at the 8th, 9th and 12th levels. At the Mag shaft the diamond drill has found siliceous limestone to a depth of 900 feet below the 12th level.

### Gila County.

The Con. M. & D. Co. is developing copper claims 6 miles southwest of Globe in the foothills of the Pinal mountains. Shaft sinking is being pushed with three shifts. L. G. Stewart is superintendent and T. C. North mine foreman.

### Mohave County.

A crosscut from the bottom of the 175-foot level of the Vanderbilt mine, at Cerbat, has entered a 4-foot vein of good ore. It is being worked by the Cerbat Mountain M. Co.—The shafthouse, shaft and machinery of the Elkhart mine, at Chloride, are being repaired before sinking the main shaft to a depth of 1000 feet.—T. Donahue and J. Polson are working the Katherine mine, at Pyramid. They report that the shaft has been timbered to the surface and drifts have been run off into the ore body, and that as soon as the hoisting plant is put in sinking will be commenced.—Canos & Schemmelpennig have opened rich ore in the Virginia mine, near Chloride.—C. D. Pickering, superintendent of the Yucca Cyanide Co., reports that the shaft of the San Francisco mine, in the Cedar section, which is being sunk to the 500 level, has encountered a large flow of water and a bigger pump will have to be installed to handle it. The ore body has increased and shows permanency. The mill has been running for some time past and turned out considerable bullion.—T. Ewing is putting in two hoisting plants on the Hardy mines, in the Silver Creek country, north of Vivian.

### Pinal County.

The Troy-Manhattan Copper Co. will put in an additional 200-foot stack at Troy. The present smelter is in operation.

## Yavapai County.

(Special Correspondence).—At the Golden Wave mine, near Congress, a tunnel intended to cut the ledge at 1000 feet is being driven. The mill is running occasionally. At the Congress mine, at Congress, more work is to be done in the mine and the stamp mill may again be running before the end of the year.

Congress, April 18.

(Special Correspondence).—At the Nincon mines, near Martinez, a new hoist will be put in with a capacity of 2000 feet. A milling and concentrating plant with fifty tons capacity has been ordered. After the ore is concentrated the tailings will be worked by the cyanide process. The main shaft has been sunk to a depth of 950 feet. In the same district the Saylor G. M. Co., which has taken over the Churchill group, has let a contract for 50 feet of sinking in the bottom of the shaft, giving a total depth of 420 feet.

Martinez, April 17.

## CALIFORNIA.

### Amador County.

At the Rhetta Con. Co.'s Bay State and Rhetta mines, near Plymouth, Superintendent W. W. Worthing reports a good strike in the Rhetta mine. The 10-stamp mill at the Bay State is crushing ore from the new strike in the Rhetta.—It is reported that the California Ore Sampling Co. will build a warehouse at Martell's station, near Sutter Creek, where ore and tailings will be purchased.

The annual report of Superintendent W. R. Thomas of the Central Eureka, at Sutter Creek, shows that for the year ending April 1, 1905, most of the work has been done below the 2100-foot level, as the ore body is wider and of better grade than it is in the upper levels, and it was decided to sink and open up the bottom part of the mine first, as the ore in the upper levels can be held in reserve for the future. On the north side of the shaft, at the 2200-foot and 2300-foot levels, is the principal ore body being mined. This ore averages \$7 per ton. Shaft sinking is now progressing and in a short time it ought to reach the 2400-foot level. Total ore milled during the year was 59,700 tons, yielding \$398,815.81 in free gold and \$2113.43 in free silver; 664 tons sulphurets, \$57,238.11; slimes (lessors), \$315.22—a total of \$458,482.57.

Less bullion charges and reduction of sulphurets.....\$0,543 79

Average value in free gold, per ton..... 6 7153  
Average value in sulphurets, per ton..... 6584  
Average value in slimes, per ton..... 0091  
Average assay of tailings..... 63

Actual value of ore.....\$8 3075

Average net value in free gold, per ton.....\$8 081  
Average net value in sulphurets, per ton..... 8224  
Average net value in slimes, per ton..... 0091

Total net value, after deducting cost of refining bullion and reduction of sulphurets.....\$7 5175

Quicksilver fed inside batteries, ounces..... 30,102  
Average yield in free gold per ounce of quicksilver fed.....\$13 254  
Amalgam cleaned up, ounces..... 61,922  
Average yield per ounce of amalgam..... 80 4313

In presenting the cost sheet, every expense is charged to mining and milling. During the year four new concentrators were put in the mill and duplicate parts for the hoist and the mill have been purchased.

Items.	Cost Sheet. Mining.	Development and Dead Work.	Milling.
Management.....	\$2,000 00	\$1,250 00	\$1,350 00
Office.....	509 50	150 00	350 00
Labor.....	58,238 75	13,808 46	8,361 00
Power and water.....	2,021 54	300 00	4,500 00
Electric light.....	107 40	75 00	225 00
Fuel oil.....	5,053 48	2,000 00	.....
Timbers and spiling.....	4,037 41	2,300 00	.....
Lumber.....	781 40	1,200 00	.....
Powder.....	2,500 00	312 48	.....
Fuse and caps.....	408 50	02 00	.....
Candles.....	700 00	223 80	.....
Iron and steel.....	454 92	200 00	.....
Hardware and nails.....	558 50	175 50	.....
Coal and coke.....	185 00	75 00	25 00
Oils and lubricants.....	300 00	.....	255 00
Shoes and dies.....	.....	.....	2,334 00
Lining and repairs.....	.....	.....	957 33
Screening.....	.....	.....	218 02
Belt and lacing.....	20 00	.....	140 00
Assaying and chemicals.....	038 00	.....	631 24
Quicksilver.....	.....	.....	370 50
Freight and express.....	516 50	67 02	253 50
Telephone.....	40 05	10 00	10 00
Taxes and insurance.....	2,157 50	.....	003 02
Machinery and extras.....	587 19	.....	1,702 00
Machine drills and repairs.....	350 00	50 00	.....
Ropes and cables.....	300 00	172 71	.....
Surveying.....	270 00	.....	.....
Legal.....	585 19	.....	.....
Damages.....	375 00	.....	.....
Miscellaneous supplies.....	68 05	13 12	13 13
Totals.....	\$84,789 67	\$22,080 00	\$23,393 00

### COST OF MINING AND MILLING.

Cost of mining, per ton.....\$1 42  
Cost of dead work and development, per ton..... 38  
Cost of milling, per ton..... 375

Total cost, per ton.....\$2 175

The secretary's report of work for the past three years shows that the 40-stamp mill has treated 191,648 tons at an average value of \$7.16 per ton, and a total cost of \$2.804 for 1902, \$2.36 for 1903 and \$2.175 for 1904.

### Calaveras County.

Work has been resumed in the Sultana mine at Angels.—The new 10-stamp mill on the mine of D. Koller at Carson has been started.—The Hagerman gravel mine, near San Andreas, has been sold by the Eastland-Gray Co. of Oakland, Cal. A new air compressor is being placed.—The Clary G. M. Co. is working the South Bank on Indian creek, near Sheep Ranch, under the superintendency of W. H. Clary. The main shaft is down 240 feet, and two drifts or levels have been run, one at 125 feet and the other at 240 feet. The company will put in a 10-stamp mill.—J. A. Campbell and C. V. Zim have hounded the Buckhorn mines, west of Murphys, and will begin work of development.

Assistant Superintendent D. McClure of the Gwin

mine, at Gwin Mine, reports that the main shaft will be sunk 200 feet deeper. The winze sunk from the present level on the rich streak recently encountered continued downward holding its width well.—It is reported that men will be put on at the Clark & Mahon mine at Oleta, the owners having completed arrangements to go on with development work.—G. Deitz is working the Croff & McCleary claim at Oleta.—The American Flat Co. has struck a good streak of gravel in their claim at Oleta.—L. Smith and C. Wilson are piping on their claim at Oleta.

### El Dorado County.

Work has been started on the Alpine mine, near Garden Valley.—Work has been resumed on the Gold & Silver mine, near Kelsey, under the supervision of B. L. Peters.—The bedrock cut at the Gravel Hill mine, 4 miles west of Georgetown, has been completed and hydraulicking commenced. This mine is owned by W. Barklage and managed by E. C. Zorres.

### Madera County.

A strike of native copper is reported from the 100-foot level in the Yosemite copper mine, on the Daulton ranch, near Madera, by Superintendent J. M. Hamblton.

### Mariposa County.

The mill at the Mariposa mine, near Mariposa, has been completely destroyed by fire. The loss is about \$30,000; uninsured. The last clean-up was just being finished. The mill was built in 1900 and has run continuously ever since. It had just closed down and would probably have been moved to some other property on the grant at a later date, though it would no doubt have been used for milling ore from nearby mines for a time.—S. L. Brown, superintendent of the Tennessee and California gold mine, near Indian Gulch, is arranging for hauling a hoist, stamp mill and lumber to retimber the shaft.

### Nevada County.

The 10-stamp mill of the Sultana mine, near Grass Valley, is to be increased by 30 stamps. It is also stated that the New Orleans mill, near Grass Valley, is to be enlarged. It is stated that those two mines will build a 2-mile pipe line, as the Empire M. Co. has refused to supply them with water.

### Placer County.

The Cash Rock mine at Forest Hill will commence work this spring.

### San Bernardino County.

Shipments of tungsten ore are reported from a number of claims between Randsburg and St. Elmo.

### San Diego County.

(Special Correspondence).—It has been reported that the Oro Flamme mine, situated on the east side of the Cuyamaca range, on the road between Stonewall mine and Pine Valley, has been bought by the Cuyamaca M. Co., but this has been denied by the company. About seventeen years ago the Oro Flamme Co. built a mill at the mine, and the difficulties of getting the mill in place were so great, owing to the precipitous character of the mountains, that notwithstanding the fact that the mine did not pay, it was considered inexpedient to remove the mill, as it would cost more than the machinery was worth. The nearest prospects to the Oro Flamme are those in Deer Park and Pine Valley. The formation is mica-schist, mica-slate and eruptive rocks of several kinds, and the ores are mostly high grade, though the veins are generally small.

Pine Valley, April 17.

### Siskiyou County.

Work has been started at the American mine, 2 miles east of French Gulch, under the direction of Superintendent Thomas.—A 5-stamp mill will be built on the Dobrowsky mine, near Shasta, by H. O. Cummins, manager of the Middle Creek M. Co.—T-rails are used for rifle bars in the tail races at the Lagrange hydraulic mine on Oregon Gulch mountain, near Weaverville, by Manager P. Bouery.

The smelter at the Aftersought mine of the Great Western Gold Co., at Ingot, is reported to have been closed down, presumably because of some fault in the process of reduction. It is reported that roasting before smelting may be tried.

### Siskiyou County.

G. T. Salsbury of Ashland, Or., working the Jillson mine near Hornbrook, claims he is mining and milling the low-grade ore at \$1.50 a ton.

### Trinity County.

La Grange mine, on Oregon Gulch mountain, 6 miles west of Weaverville, has been sold to an Eastern syndicate. P. Bouery has been manager for the French company owning the property. The mine has been yielding \$300,000 a year in gold profit for ten years and shows no sign of exhaustion. It was bought by the French company ten years ago for \$225,000. It has since spent \$600,000 in improvements that include the building of a flume 30 miles long and digging a tunnel 1½ mile in length through a mountain to convey water from Sturtevant fork to the mine. For hydraulicking, water is conveyed across a canyon in an inverted siphon.

### Tuolumne County.

A strike of good milling ore is reported from the Gold Bug mine, Big Oak Flat.—At the Red Jacket, Big Oak Flat, R. L. Shackleford is driving a crosscut to tap the main vein.—The Mohican mine, near Groveland, has started up after being shut down a month, because of the lack of wood and repairs to the machinery.—Arrangements have been made for the resumption of work in the Harvard mine, ½ mile west of Jamestown.

### Yuba County.

F. G. Cheney is building the two gold mining dredgers that will be constructed by the Marion Steam Shovel Works for the Marysville Gold Dredging Co. These two machines will be built near those in use at the Yuba Con. Goldfields and will build a continuation of the training walls that are to be constructed in the river for the Government.



## COLORADO.

## Boulder County.

The Copper Ocean M. & M. Co. has been formed. T. Lavridson, president; S. B. Kerr, vice-president; J. T. Cheney, secretary, and A. L. Dow, treasurer. The property which the company will operate is the Copper Ocean mine, 3 miles west of Lyons, and has been worked nearly all winter.

## Chaffee County.

The Stars and Stripes, near Turret, has been sold to the Pittsburg M., M. & D. Co. of Pittsburg, Pa. V. A. Lucier, W. D. Rhodaherger and J. Glashaw, three of the principal stockholders in the Pittsburg Co., have been at the mines. A wagon road will be made to the group and machinery put in.—H. Cocking is operating the W. & W., near Salida.—The Salida mine, 3 miles north of Salida, is taking out 1000 tons of shipping ore monthly. The copper leaching plant built near the property is not in operation. It is claimed that the process is not practical as its present stage, and alternations and improvements will be made. B. Ross of Denver, former manager of the Homestake on Gold Hill, Cripple Creek, is the president and general manager.

## Clear Creek County.

Operations on the Wilcox tunnel have been resumed, after a temporary shutdown caused by one of the Silver Plume transformers burning out. The management of the Waldorf Co. took advantage of the intervening time and overhauled the machinery, putting in two new compressors. The tunnel is in nearly 4000 feet. C. L. Tingle is superintendent.—A strike is reported in the Sceptre tunnel on Democrat mountain, by I. R. Clapper, 1900 feet from the portal.—T. Tyler, manager of the Duluth & Colorado M. Co., in Daily district, near Georgetown, reports that the Uncle Sam tunnel is in 270 feet. The Continental tunnel, started a few weeks ago, is in 60 feet and is encountering stringers of ore.

Foreman C. Garrett of the Stevens mine and mill at Silver Plume expects to have the mill running by the first of May, as the melting snow will provide plenty of water. The mill has been overhauled. Development work has been kept up in the mine during the winter. Connection will be made from the Stevens workings with the Tobin tunnel of the Waldorf properties on the East Argentine side of the mountain within a few months, and ore from the veins that have been opened in that tunnel can also be treated at the Stevens mill.—Preparations are being made for a mill at the mouth of the Wilcox tunnel.—It is reported that the owners of the Mammoth property in Brown gulch, near Silver Plume, will commence work, after several years' idleness. P. Kennedy, J. J. O'Neil and Leonard of Denver are the owners.

D. W. Shepard of Georgetown, manager of the Anglo-Saxon Mines Development Co., has completed a tramway for carrying ore material to a concentrating mill of 100 tons capacity to be built soon.—Work has been resumed on the Big Blue of Georgetown.—A strike is reported on the Mineral Chief, near Georgetown, in drifting on the vein from the Moline tunnel. A contract to drift 1000 feet west on the vein has been let to Nelson Bros., who propose putting in a compressor and drills and driving it with three eight-hour shifts. The property is under bond to the owners of the Kelley tunnel.

## Dolores County.

The Dunton Con. M. Co. is developing claims in the Dunton or Lone Cone mining district. Three 8-hour shifts are now being worked on the drift, which is in over 200 feet with a 160-foot raise to the surface, and 1000 feet from the mouth of the tunnel it is intended to make another raise of 200 feet to connect with tunnel No. 3. W. Wittle is manager.

## Fremont County.

(Special Correspondence).—It is understood that after a cessation for several months nearly all of the coal mines in Fremont county have started operations. The railroads have granted a reduction of 25 cents per ton for hauling coal and this reduced rate has given the industry an impetus to start up.

Florence, April 17.

## Giblin County.

E. S. Moulton reports high-grade ore at the Cotton mine of the Nemaha group on Boh Tail hill, near Central City.—The American National Bank has transferred to G. Aarons and J. H. Gower the Clay County mine in Lake district for \$8000.—The Cissler lode, Russell district, has been sold by E. E. Chase of Denver to L. & P. Sternberger.—Ore from the 600-foot east level of the Pittsburg mine in lower Russell district, operated by the Cashier G. M. & R. Co., shows a high value in gold, silver and copper.—Philadelphia owners are arranging to start up the Avon mill in Nevada gulch to treat the ores from their San Juan and Avon properties. The mill has been shut down since last summer because of failure of water for milling, it formerly being supplied by the Gunnell mine before the plant of the latter property was destroyed by fire. Nevada gulch will furnish sufficient water three months, and by that time it is expected that the Gunnell property will be operating again.—Rule & Trezise are shipping twenty tons per day from their lease in the 334 and 400-foot levels of the Protection mine of the Roderick Dhu property on the "Patch." It is reported that the main shaft, known as No. 485, is to be started again, and that an air compressor plant will be put in by the Roderick Dhu.

## Gunnison County.

W. S. Henderson has started work on the Belzora-Bassick group, near Pitkin.—The Jersey Blue mill, near Pitkin, is ready to start treating ore from the Cortland dump.—The Gray Eagle tunnel, near Pitkin, has been driven 200 feet by Wackerly & Smith.—The Lamphier group, west of Ohio creek, at Lamphier lake, has been sold to Eastern parties.—It is reported that the Sporting Times claims, near Pitkin, are to be worked by F. Schrott and associates. Operations had to be suspended on account of a large flow of water in the shaft, making it necessary to run a tunnel for drainage purposes.—Work on the Robert E. Lee tunnel, near Pitkin, has been delayed because of the heavy snows.—The Indiana G. & S. M. & M. Co., on McClellan

mountain, near Pitkin, will commence operations as soon as the snow melts sufficiently.

E. E. Connery and W. G. Baird of St. Charles, Mo., officers of the Continental Mines Co., at Vulcan, have been arranging for the summer's work.—A rich strike is reported in the Gold Links tunnel, above Ohio City. The ore is in 1200 feet.—Near Italian mountain, at the head of Taylor river, and at the X-10-U-8 mine, G. Hubbard is ready to start shipping ore.

## Lake County.

J. L. Jenkins has started work on the Trilby group, on the southern slope of Gold hill, in Black Cloud gulch, near Twin Lakes.

At the Murphy shaft, Rock hill, Leadville, the main drift has not reached the end of the ore shoot.—Work has been resumed on the Sullivan and the Lucky Joe shafts on the Nisi Prius ground.—J. McAllister has resumed underground work on the Smuggler, Iron hill, Leadville. A gallows frame has been put up.—The Fanny Rawlins, Breece hill, Leadville, is shipping 50 tons daily of good grade ore and carrying on development work in new ground.—The Elk people are still working on a small streak of rich ore and shipping 150 tons per month.—The Highland Chief is sending out 25 tons daily of siliceous ore.—The new pumps, extra boilers and connections have been completed at the Penrose, at Leadville. Three pumps are in the shaft, with a combined capacity of 1950 gallons per minute. The management expects to lower the water 5 feet daily, at which rate it will take twenty-five days to reach the bottom of the shaft. When this is reached a compound station pump will be put in to handle the extra flow of water. There are still 20 feet to be sunk before the shaft is deep enough to drift to the Coronado. When sinking is completed the shaft will be 50 feet deeper than the Coronado, and all of the water from that property will be diverted to the Penrose, which will be used as the main pumping shaft for the two mines. This will drain the Coronado and permit of handling the ore at reduced cost. The Coronado is shipping 50 tons daily, which comes from development work. When stoping begins the output will be 250 tons daily.

## Ouray County.

The Joker tunnel of the Red Mountain R., M. & S. Co., near Ouray, is past the 1000-foot mark. Superintendent Aston has charge.—The management of the Treasury tunnel, in Red Mountain district, hopes to start its full force. The property has not been working for several weeks on account of lack of coal, as the roads have been in very bad condition.—The Revenue tunnel is increasing its force.—The Tempest Apex Co. is taking out good ore from the Mickey Breen. The mill will be started soon.—Arrangements are being made for building a 40-stamp mill on the Security G. M. Co.'s property on Cow creek, near Ouray. A wagon road is being built from the millsite to pine timber for the mill and mine buildings.—The tunnel of the Ouray Con. M. Co. at Ouray is being driven by Superintendent J. H. Tumhach at the rate of 2½ feet per day, hand work. The tunnel is in 400 feet and is 6x8½ feet.

## San Juan County.

(Special Correspondence).—Plans have been drawn and the contract closed for a 500-ton concentrating mill to be built at Animas Forks, 12 miles north of Silverton. This mill will handle the ore from the old Sunnyside Extension mine, now known as the Gold Prince, W. Z. Kinney, manager. The starting of this enterprise will have a good effect on other companies throughout the State that are contemplating the erection of reduction works. It is understood an aerial tramway will also be built to convey the ore from the mine to the mill. Silverton, April 17.

The air compressor has been put in for the power drills at the Ruby Basin M. & M. Co.'s crosscut, destined to tap the Tornado of North Lookout mountain, near Silverton.—W. N. Sisson, superintendent of the Northern Light M. Co., Boulder mountain, near Silverton, thinks the company will start in May opening the Ariadne and driving a crosscut from the level of Cement creek which will intersect consecutively all the claims of the group.

Manager J. B. Warner announces that just as soon as the snow disappears the Silver Ledge properties, near Chattanooga, will be worked. The product of this property is impregnated with zinc, and the greater part of last season at the mill was spent in attempting to get at the proper way of separating zinc and iron, so that these two products might be saved in a marketable form. Late in the season the problem was solved when a system of electrical separators was put in. At that time the mill was being run by water power, and in November, owing to the general freeze-up, operations had to be suspended and the mill has stood idle ever since. This year steam and electrical power are to be put in and the concentrator will be enabled to run the year through regardless of weather.

## San Miguel County.

The Ophir Con. group at Ophir Loop, 14 miles from Telluride, plans to remodel the 50-stamp mill to treat tungsten mineral.—The Japan group in Savage basin have finished the connection between the upraise driven from the lower workings and the bottom of a shaft sunk from the lower level of the upper workings, draining the property of 3,000,000 gallons of water and establishing good ventilation. It is the intention of the company, before starting to work the mines, to determine by tests the method best adapted for the treatment of the product.

## Summit County.

The Old Union M. & M. Co. of Breckenridge has started its first stope from the main tunnel at 350 feet from the mouth of the tunnel. A ditch is now being built to supply the new 100-ton capacity mill with water.—N. J. Coleman has run the Silver Dick tunnel, on the Red Mountain side of the Silverton-Red Mountain Railroad, ½ mile below Chattanooga.—The Brooklyn, near Chattanooga, under the management of T. Manion and E. A. Ormland, is doing a little development.

The Laurium group, near Breckenridge, which is developed by a 1300-foot tunnel, is reported as looking so

favorable that the owners are considering building a 30-ton concentrating mill near the entrance to the tunnel. The property is owned by Forman & Walker and is near the middle of the Mount Baldy and Nigger Hill lead-silver zone.—The force at the North American and Mary Verna properties, in the Ten Mile district, near Breckenridge, is to be increased as soon as necessary room in the mines can be made for additional miners.—The French Creek tunnel, near Breckenridge, is under contract to E. T. Brooks.

## Teller County.

Underground connection has been made between the New Haven and Jo Dandy mines on Raven hill, Cripple Creek.—Hoisting machinery and machine drills are to be put in the shaft of the Home Lode of the Cedar Hill G. M. Co. of Cripple Creek. The shaft is to be sunk to a depth of 200 feet, being down 60 feet.—Manager Van Fleet of the Montrose lode on Ironclad hill is putting in a new compressor and machine drills.—The cyanide mill that is being operated by the R. E. A. & A. Co. at the Wild Horse mine, Cripple Creek, is treating nearly 100 tons per day. Most of the ore now being treated at the mill is being taken from the large dump at the mine.—McGee and associates, operating under lease the Mohawk Bell and Twin Sisters claims on Raven hill, are now making regular shipments of a good grade of ore. The operators have opened up three distinct ore shoots in different places in the drifts at a depth of 140 feet, and each body is ranging from 2 to 5 feet in width. They intend sinking the shaft.—Jackson and associates, operating under lease the Mary Nevins property on Rosebud hill, are putting in an air compressor, and expect to sink the shaft an additional 100 feet. The shaft is down 250 feet.—The west shoot at the 900-foot level of the Elktion at Cripple Creek is being developed.

—The Blue Bird Co. on Bull hill has given contract to A. Denslow and J. J. Acton of Cripple Creek to drift 300 feet and upraise 50 feet at the 1300-foot level so as to make an air connection at the northern extremity of the Portland estate. President E. S. Johnson plans to provide an outlet for the carbonic acid gas recently encountered at the 1300-foot level.—Molvany and associates, leasing a block of the Ajax on Battle mountain, will put machinery on their ground to increase the tonnage.—The Golden Wedge on Beacon hill is being equipped with new machinery to facilitate sinking another 100 feet.—During March the total shipments leaving the Stratton's Independence mine amounted to 5500 tons.—Lessee Walden and associates, operating the main workings of the Rose Nicol property on Battle mountain, are sinking the shaft another 100 feet.—Operations have been started on the Jefferson property at Victor by W. H. Camp of Colorado Springs.—The Milwaukee Mutual M. Co., operating under lease a block of the Mabel M. property, owned by the Gold Dollar Con. Co., is sending out regular shipments from the body of ore recently opened up.—Operations have been resumed on the Pinnacle mine on Bull hill by G. Glenn of Cripple Creek.—It is reported that the officials of the Portland G. M. Co. had decided not to lease the big dump at the No. 1 shaft, but to treat it at their own mill at Colorado Springs.

## IDAHO.

## Blaine County.

J. B. Gieske, the president of the Idaho Con. M. & D. Co. at Soldier, has appointed W. Teasdale as superintendent, who has started work upon the company's Golden Rule group in the Big Smoky region.—F. W. B. Johnson, superintendent of the Wood River Zinc Co., expects the new mill, near Halley, to be ready by May 15.

The Northwestern M. Co., under the management of R. T. Tustin, is working a large force on the Weber property driving a crosscut tunnel to tap their vein at depth, which, when completed, will be 1700 feet in length. They expect to build a mill this season. The mine is in the Muldoon district, 20 miles east of Bellevue.—The Argosy M. Co. is doing considerable work in the same district.

## Boise County.

J. H. Emery, manager of the Gold Coin M. Co., near Idaho City, says a mill will be put up at the mine this summer, and an electric plant will be put in on More creek to furnish power for mill and mine.—The Ben Solomo ditch, 7000 feet long, will be enlarged to carry 800 inches of water and give a pressure of 129 feet. They intend to run a tunnel on the ledge from Washington gulch.—Blaine & Co. of Placerville have let the contract for the excavation for their new dredge which is to be 85x135 feet and 7 feet deep.—D. Coughanour and D. Tew of Quartzburg intend to put a mill on the Belshazzar mine. They are putting men to work on the road to the mine.—The Iowa mine and mill near Placerville will start up soon.

O. N. Callender, of Emmett, president of the Buckeye M. Co., of Pearl, reports that the company will sink an incline shaft on the ledge.

## Custer County.

J. N. Wallace, of Boise, president of the Van Anda M. & M. Co., reports striking a good ledge in the tunnel of the Van Anda, 3 miles from Custer, 600 feet from the tunnel portal.

## Elmore County.

M. Jacobs, of Boise, reports that Speer's American Exchange will put in a 100-ton cyanide plant at the Petit mine near Atlanta. L. W. Speer and party are expected at Boise to inspect the mine.

## Shoshone County.

C. Manley, manager of the Blackhorse mine, near Murray, reports that the lower tunnel is in nearly 150 feet, and is expected to reach the ledge by May 1, when regular shipping will be commenced.—The Monarch mill at Murray is shipping concentrates regularly. E. P. Spaulding is manager.—The main tunnel of the Majestic M. Co. of Burke is in 220 feet. C. K. Cartwright, superintendent of the Burke mines of the Federal Co., and J. C. Browne, superintendent of the Hecla mine at Burke, are interested.—The War Eagle M. Co., 1½ mile from Wallace, on the west fork of Placer creek, have run their tunnel 1600 feet on the War Eagle.



G. R. Trask is the engineer for the company and acting as manager.

The Morning, Hecla and Frisco mines' statements for 1904 show that the Morning suffered during the year on account of shutdowns due to insufficient water supply. The Hecla surpasses its record of any former year; the Frisco was worked only by leasers and not upon the scale of former years. The Hecla report was: Tons shipped, concentrates, 13,670; gross yield, \$671,251.89; transportation, cost, \$103,703.01; reduction, cost \$34,401; construction, betterments and repair, etc., \$21,859.56; mining and milling, \$304,277.24; total expense, \$463,740.81; net profit, \$207,510.44. The Morning report was: Tons produced, 235,775; gross yield, \$1,292,903.30; mining and milling, \$474,406.12; treatment and transportation, \$591,197.74; improvements, \$59,194.58; total expense, \$1,117,798.44; net profit, \$175,106.86. The Frisco report was: Tons ore and concentrates, 1434; gross yield, \$78,167.19; mining and milling, \$35,422.59; general expenses, \$5,773.76; transportation, \$11,572.00; reduction, \$18,534.39; improvements, \$390.66; total expenses, \$71,693.42; net profit, \$6,473.77.

#### Washington County.

C. W. Jones reports the Ladds Metals Co. is preparing to rebuild the smelter at Landoro and put in a reverberatory furnace. It has 4000 tons for treatment on hand.—D. C. Nevin, president of the Iron Springs Co., is in the East, but is expected to arrive shortly. A portion of the mill machinery has already arrived. The company will build a cyanide plant with a 200-ton capacity.—F. T. Mathias & Sons have started work at Grouse creek.

### MICHIGAN.

(Special Correspondence).—The production of the Michigan mines for March was 19,300,000 pounds of refined copper.—At the Adventure Con. mine 18½ pounds of refined copper are being obtained per ton of rock treated. Drifting east from No. 3 shaft on the Knowlton lode at the eighth and ninth levels is opening good ground. The Adventure is employing 250 men and the daily rock shipments average 375 tons.—The Michigan mine is shipping 480 tons daily to the Mass Con. stamp mill at Keweenaw bay, with prospects for increase when the mill is improved.—Equipment for the addition to the Champion stamp mill at Freda is being put in. The experimental outfit will consist of crushers and rolls and necessary adjuncts for concentration of values, with half the capacity of the simple compound stamphead.—The Wolverine Co. is repairing the stamp mill at Gay, on Traverse bay, Lake Superior. The Wolverine mill contains two heads and has been operating continuously for two years without repairs.—The permanent duplex cylinder double conical drum hoisting engine at No. 2 shaft of the Mohawk mine is being used. No. 5 shaft is down 100 feet and will be continued to a depth of 175 feet, and a drift run north to connect with the opening south from No. 4 shaft on that level.—Operations have been resumed at the Franklin Junior and Franklin branches of the Franklin M. Co. after an idleness of twenty days caused by the strike of underground employees. No concessions were granted to the men by the company and they returned to work under the same terms as before. It is likely that the Franklin management will begin diamond drill exploratory work to locate the southern extension of the Kearsarge amygdaloid lode.—Navigation has opened at copper ports.—Arrangements have been made by the Quincy M. Co. for rebuilding its compressor at No. 6 shaft. It will be altered from a single to a two-stage machine, raising the capacity from 50 to 100 drills.

Calumet, April 15.

### MISSOURI.

#### Jasper County.

(Special Correspondence).—Considerable work is being done on Short creek, at Cave Springs, and in the Ozark range near Aurora.—H. Smith of Joplin, who is mining on the Missouri Lead & Zinc Co.'s land near Joplin, has opened up a fine prospect in an old shaft and is taking out good ore. He intends building a mill.—Hancock & Co., of Joplin, who have a lease on forty acres of land east of Joplin, have opened up a lead mine at a depth of 120 feet on virgin ground.—P. H. Puckett of Galena, Kansas, and N. P. Road of Joplin have resumed operations at their mine on the Brooks land near Zincite. The mine is producing about twenty-five tons of ore weekly. A new 10-inch lift pump will be put in.—C. L. Crockett & Co., of Joplin, who are mining at Tuckahoe, have opened up a very large face of ore in a new shaft and will build a new mill.—Holmes, Cape & Rogers, of Joplin, have opened up a good mine in the Peacock district and will commence a new mill.—There are seven mills being built in the Badger district. The Kansas Natural Gas Co.'s pipe line passes through the camp and will supply the mills with a cheap fuel.—B. M. Robinson, of Joplin, has finished drilling a number of holes on S. H. Claycomb's land near Joplin, and is sinking a shaft.

Joplin, April 17.

### MONTANA.

#### Lewis and Clarke County.

The Red Bird M. Co., of Helena, is shipping from the Red Bird and Reliance. The Red Bird will be developed by sinking another 100 feet from the 350-foot level. On the Reliance the winze is being sunk in the ore. The company expects to begin operations in the Copper Hill, sinking another 100 feet.—The mill on the Whitlatch-Union, south of Helena, has been started up by Canoll & Martin. Unwatering the mine is progressing so that the property will soon be open for exploration. The new shaft, which has been sunk 42 feet, will be sent down another 100 feet, and crosscuts run.

#### Madison County.

Operations will soon be resumed on the McVey property, owned by the Minnesota & Montana Co., at Sand creek. The 250-foot shaft is being repaired preparatory to sinking an additional 200 feet.—It is reported that, in Alder gulch, near Virginia City, the Alder Co. is preparing to start up the mill and concentrator at the

Kearsarge properties and that the entire sixty stamps will be in operation.—At the General Shafter mine, of the Dakota M. Co., near Virginia City, a 5-stamp mill and concentrator will be ready to start.—The two dredges of the Conroy Placer M. Co. will be running as soon as the water starts through the Alder creek again.

It is reported that work will be resumed on the Easton mine, near Virginia City, by Superintendent J. H. Pankey. The Easton mill will be closed down for repairs April 25 to be overhauled.—It is stated that the Alder Gulch M. & M. Co., near Virginia City, is preparing to start up the mill and concentrator at the Kearsarge properties. The General Shafter mine, of the Dakota M. Co., is undergoing alterations, and a 5-stamp mill and concentrator will be ready to start soon. The two dredges of the Conroy Placer M. Co. will be running as soon as the water starts through Alder creek again.—Operations will be resumed in the McVey property of the Minnesota & Montana Co., at Sand creek. A 250-foot shaft is being repaired with a view to being sunk 200 feet.

#### Missoula County.

The Cape Nome, 19 miles east of Missoula, has started shipping copper ore to the East Helena smelter. New machinery is to be put in.

#### Silver Bow County.

The Parrot mine at Butte has been closed through an injunction issued on application of the Nipper Con. Copper Co., in an action instituted charging that the Parrot Silver & Copper Co.'s agents were extracting ores from the Nipper vein on various levels below the 1000 station and hoisting it to the surface through the Parrot shaft.

### NEVADA.

The Supreme Court has upheld the act of 1903 making it a misdemeanor for employees to work longer than eight hours in one day in underground mines, smelters, and in all institutions for the reduction or refining of ores or metals. The opinion was handed down in the case of the State of Nevada vs. P. Kair, coming up from the county of Lyon on a petition for a writ of habeas corpus. Kair was employed at Dayton in a wet crushing quartz mill and was fined \$100 in the township court for working a longer period than eight hours in one day.

#### Esmeralda County.

At the Florence mine, near Goldfield, F. Oliver, the superintendent, has started timbering the shaft to the 200-foot level, preparatory to sinking an additional 50 feet. Grading has commenced for the new ore house. A new gallow frame has been ordered.—A. H. Mayne is developing the Goldfield Jim on the northwest slope of Columbia mountain and intends to build a cyanide plant.—The Hiawatha M. Co., of Goldfield, is operating a lease on the Silver Pick property. The working shaft is down 110 feet.

Topographers and geologists of the United States Geological Survey will be at work during the coming summer south and east of Tonopah. A party of fifteen under the direction of R. H. Chapman will make surveys for three topographic maps. Two of these maps will be detail maps by W. Stranaban, one of the Goldfield district, 23½ miles southeast of Tonopah, and one of the Bullfrog district, which is 60 miles south of Goldfield. The Goldfield map will cover 40 square miles and will be drawn on a scale of 2000 feet to the inch. Triangulation and leveling will be carried from Owens valley to get control for the Bullfrog map, which will also be drawn on a scale of 2000 feet to the inch. The third map will be a reconnaissance map 120 miles long by 90 miles wide, south and southeast of Goldfield. It will include Goldfield in its northwest corner. The heights and shapes of all the mountains will be shown, as well as all roads, all springs, and water holes. The reconnaissance map will include part of Death valley. Levels for the control of all this work are being made from Mohave by a topographic party under R. H. Farmer. It is hoped that there will be an opportunity of running a level line to find the correct elevation of Death valley. E. M. Douglas, chief of the western section of topography, has computed that the lowest point in the valley is 450 feet below sea level. Geologic studies in these same Nevada areas will be prosecuted during the summer under the direction of J. E. Spurr.

#### Enreka County.

S. W. West is shipping 150 tons daily from the West M. Co. iron deposits, 6 miles west of Palisade, to the American S. & R. Co.

E. Hoffman, superintendent of the Carisa M. Co. at Eureka, reports eight sets of lessees working on ores. The main shaft is to be sunk to the 1200-foot level before another level is established.

#### Lincoln County.

After five month's work A. B. Hall has cleaned up the tailings pile at the Quartette river mill, near Searchlight, treating 9000 tons in the cyanide plant. The sampling room, attached to the mill, is being torn down and the material taken to the mine.—G. M. Rose and J. C. Tipton have been at Searchlight making arrangements for putting in a cyanide plant to work the tailings of the Southern Nevada mine.

#### Storey County.

The Comstock Pumping Association will repair the Sutor tunnel and its north and south lateral branches on the Comstock lode and equip them with drain pipes to carry off the water that is pumped from the lower levels of the Comstock mines. L. M. Hall, superintendent of the pumping association, will take charge of the work. The purpose is to have the mines drained and repaired jointly. The expense will be borne by the several companies.

### NEW MEXICO.

#### Colfax County.

The 150-foot mark has been passed in the Deep Tunnel mine, near Elizabethtown, and a contract has been let for 100 feet more work by McIntyre Bros.

There will be an abundance of water in the Elizabethtown and nearby districts. Among those at Elizabethtown preparing for hydraulic work this summer are: J. Lowrey in Humburg gulch; H. Kaiser, Willow creek; F. Wilkinson, B. Geskie and M. Mead, Ute creek; Horner Bros. and B. Geskie, South Ponil placers.

#### Grant County.

In the Burro Mountain mining district, 14 miles southwest of Silver City, the St. Louis mine is producing a carload of concentrates daily. The property is managed by T. Carter.—The Colorado Fuel & Iron Co. is getting out 600 tons of iron ore per day from its mines in the Fierro district.—J. W. Bible, manager of the Nevada Copper M. Co., in the Hanover district, has 100 men developing the mines.—The Santa Rita Copper M. Co. is producing three carloads of copper ore per day, which is shipped to El Paso smelters. J. Deagan is the manager.—The Comanche Copper & Smelting Co. of Silver City has purchased the Hearst properties in the Pinos Altos district, and the arrangements are perfected for the construction of a narrow gauge railroad 9 miles from Silver City to Pinos Altos.

Blackburn & Campbell of Lordsburg and D. C. Kase-man of Shamokin, Pa., have taken a bond and lease on the Nellie Bly, south of Lordsburg. The workings are at water level and it will be necessary to put in a pump. A bond and lease was also taken by the same parties on the Robert E. Lee, adjoining the Nellie Bly. The company is to be incorporated as the Pyramid Peak Copper Co.

#### Sierra County.

The Empire G. M. & M. Co. is building an assay office and warehouse at Cold Springs. The company intends to rebuild the smelter at Kingston.

The deal for the Union and Esperanza claims at Shandon, in the Pittsburg placer district, has been closed by B. Silva with the Union Esperanza M. Co., which company is making arrangements for the installation of a 400 H. P. hydraulic plant.

#### Union County.

The Coronado C. Co. has acquired interests in Peacock canyon, northeast Union county, in the Cimarron River valley.

### OREGON.

#### Baker County.

The Oregon M. & D. Co. are completing a cyanide plant to work the tailings from the Virtue mill, near Baker City. It is planned to scrape the tailings to a common center, using ordinary road scrapers, and then, by means of an elevator, convey them to the vats. It is believed that this can be done at a cost not to exceed 6 cents per ton.—A. Larsen of Greenbourn reports striking the vein on the property of the Little Salmon G. M. Co., 240 feet from the mouth of the tunnel.

#### Grant County.

Superintendent N. F. Heath of the Standard mine, near Prairie City, says that Manager H. H. Nicholson has ordered a gasoline engine, dynamo and electric drills.

J. R. Cassin of Spokane, Wash., says that work will be started at the Alamo mine, near Granite, during May.

Superintendent W. E. Gifford of the Present Need, near Comer, reports a strike of ore.—Manager J. W. Messmer of the Prairie Diggings mine, near John Day, plans reopening the property.

#### Josephine County.

P. B. Wickersham and J. E. Loomis have a lease on a placer below Galice and are working it steadily.

#### Lane County.

D. H. Weyant is working the Simmons paint deposit, 2 miles from Walker.

### SOUTH DAKOTA.

#### Lawrence County.

The Elliptic M. Co., in Miller gulch, northwest of Deadwood, is down 230 feet in its shaft.—It is reported that the reorganization plans of the Clover Leaf M. Co. have carried at the special meeting at Beulah, Wyo. By the action at this meeting the capitalization of the company is changed from 12,000 shares of \$100 each, to 2,500,000 shares of \$1 each.—Mechanical stokers are proving satisfactory to the Homestake Co., at Lead. A year ago several of these stokers were installed in the Lead mill and after a year's test the company has decided to put them into the cyanide mills at Lead and in Gayville. This mechanical device gives more perfect combustion, reduces the cost of fuel and enables one man to do the work required of several when the old style furnace feed was employed.

### UTAH.

#### Salt Lake County.

The Bingham Bulletin gives the following as the number of men employed and the daily production of Bingham mines:

	Men.	Tons.
Highland Boy.....	330	850
Yampa (mine and smelter).....	300	450
Boston Consolidated.....	85	200
Bingham-New Haven.....	45	75
Utah Apex and Red Wing.....	25	700
Utah Copper (mine and mill).....	175	200
Ohio Copper (mine and mill).....	270	500
Silver Shield.....	25	...
Commercial.....	25	75
Dalton & Lark.....	275	300
Fortuna.....	45	30
Butler-Liberal.....	10	...
Phoenix.....	35	30
Various small properties.....	100	25
Totals.....	1,967	3,435

E. A. Wall has an option and commenced work on the Starless group at Bingham, owned by the Bingham-Oquirrh Co.—Superintendent McCree of the Red Wing mine at Bingham is putting in a power drill and 6-drill air compressor plant. The Red Wing tunnel is in 800 feet and will be driven 3000 feet.

The Ohio Copper Co. of Bingham will crosscut to the Bettles ledge from the 300-foot level.

#### Summit County.

To attain the depths at which it is believed the main



ore bodies of the King Con., of Park City are to be found, the management of the properties has been authorized to proceed with the installation of a Corliss engine and pump, and with this in position, says Man-S. Spiro, sinking will following. The shaft, which is down 800 feet, will be sunk to the 900-foot level, where exploratory work will begin.

#### Utah County.

The Steele mining property at the head of American Fork canyon, and owned by T. E. & R. A. Steele, will be worked this season.

### WASHINGTON.

#### Snohomish County.

Manager Morris of the Bunker Hill Co.'s Copper Bell, near Index, expects that the improvements on the experimental mill will be completed by May 1. New concentrators have been put in and steam power replaced by electricity.—A. S. Chase has resumed work on the Sunrise mine, 6 miles above Silverton.

A gasoline engine and steel track is being put in by the Buckeye Copper Co. at Index. The management will start a crosscut to be used as a permanent tunnel.—A dynamo and motor are being put in at the Copper Belle at Index to operate the mine and mill machinery.

### WYOMING.

The Copper Rock G. M. & M. Co. of Encampment has started a new shaft 4½x9 feet in the clear, which they propose to sink 500 feet. The old prospect shaft, which was down over 200 feet, and on an incline, was found too small for a working shaft. E. Young is superintendent. In the Encampment district the Copper Blossom claims near Station Three is operated by the Copper Age Co. under the management of C. W. Miller, Jr.

### FOREIGN. AUSTRALIA.

Production of gold in the Australian States and in New Zealand for 1904:

	Fine Ounces.
Victoria.....	771,298
New South Wales.....	269,817
Queensland.....	624,917
South Australia.....	17,913
Western Australia.....	1,983,230
Tasmania.....	60,000
Total Commonwealth.....	3,727,175
New Zealand.....	467,647
Total.....	4,194,822

#### Western Australia.

The West Australian Mining Industry reports that West Australia is partitioned into six land divisions. All north of 19½° south latitude is known as the Kimberley division. The Northwest is coastal, with its southern boundary at the 23d parallel, its eastern boundary being the 119th meridian of longitude south of the 23d parallel of latitude, and the 122d meridian north of that parallel. Adjoining the Northwest division on the south, and also reaching out to the 119th meridian, is the Western division, which follows the coast as far south as the Murchison river, and then 100 miles from the seashore, runs down to within 20 miles of the 29th parallel. The whole of the coastal area south of the Western division, to the intersection of the 124th meridian and the 33d parallel of latitude, forms the Southwest. The remainder of the coastal line belongs to the Eucla division, which east of the 125th meridian reaches to the 30th parallel of latitude, while farther west its northern boundary is the 32d parallel, its stretch westwards being to between the 123d and 124th meridians of longitude. The whole of the remainder of the State constitutes the Eastern division. The mining fields are situated thus: Kimberley goldfield, in the southeastern portion of the Kimberley division, reaching up to the 16th parallel in the northeast corner, and to the 18th on the northwest corner, and on the west bordered by the 126th meridian. Pilbarra goldfield in the Northwest, running not quite to the northern and eastern boundaries of the division, and on the west following the course of the Yule river to the coast. In the south it takes in a small portion of the eastern land division. It is divided into two districts, Marble Bar on the north and Nullagine on the south. West Pilbarra goldfield, adjoining the Pilbarra goldfield on the west, with the Fortescue river as its southern boundary. Ashburton goldfield, on the Ashburton river, partly in the Northwest and partly in the Western division, extending inland from a point 150 miles distant from the mouth of the river. Gascoyne goldfield, in the Western division, adjoining the Ashburton field on the south. Peak Hill goldfield, mainly in the western portion of the Western division, but also extending some distance into the Eastern division. Murchison goldfield, south of the Peak Hill field, and, like it, but to a less extent, encroaching on the Eastern division. It is divided into four districts—Nannine in the north, Mt. Magnet in the south, and Cue and Day Dawn between them. The Day Dawn district, though still kept distinct in the official returns, is practically merged in that of Cue, all the business of the district being done in the center of that district. Yalgoo goldfield, adjoining the Murchison on the south, mainly in the Western land division, but on the south stretching some distance into the Eastern division. Northampton mining district, in the Southwest, extending a little distance into the Western division. The coast forms its southwestern boundary. Yandanooka mining district, in the southwest, about one-third of the way from Geraldton to Perth. Collie coalfield, in the southwest of the Southwest division. Donybrook goldfield, still further southwest, 131 miles south of Perth. Greenbushes tinfield, southeast of the Donybrook goldfield, in the same division. Phillips River goldfield and mining district, on the southern coast, partly in the same division as the Donybrook (the Southwest), and partly in the Eastern division. Dundas goldfield, stretching to the southern boundary of the Eastern land division, and lying between the 120th and 123rd meridians. Like all those that follow, it is entirely in the Eastern division. Yilgarn goldfield, adjoining the Dundas on the northern portion of its western boundary and reaching north to

about the 30th parallel. Coolgardie goldfield, adjoining the Yilgarn field along the 120th meridian and on the south the Dundas field. It is divided into the districts of Kunanalling (on the north) and Coolgardie. East Coolgardie goldfield, on the north of the eastern portion of the Coolgardie field. Broad Arrow goldfield, on the northwest of the East Coolgardie field, on the west adjoining the Coolgardie field. Northeast Coolgardie goldfield, stretching east of the Coolgardie, East Coolgardie and Broad Arrow fields to the 125th meridian and on the south adjoining the Dundas field. It is divided into the districts of Kanowna, Bulong and Kurnalpi. North Coolgardie goldfield, reaching from the 125th meridian along the northern boundaries of the Northeast Coolgardie, Broad Arrow, Coolgardie and Yilgarn fields to the Yalgoo field, and in the northeast running to a point where the Yalgoo, Murchison and East Murchison fields meet. It is divided into the districts of Ullaring, Menzies, Niagara and Yerilla. East Murchison goldfield, bounded on the west by the Peak Hill and Murchison fields, on the north by the 26th parallel, on the east by the Mt. Margaret field and on the south by the North Coolgardie field. Mt. Margaret goldfield, reaching from the 26th parallel to the northern boundary of the North Coolgardie field on the 29th parallel and bounded on the east by the 125th meridian. It is divided into three districts—Mt. Malcolm (in the southwest corner, where the field runs in south of the East Murchison field), Mt. Morgans and Mt. Margaret.

### BRITISH COLUMBIA.

#### Boundary District.

After July 1, 1905, the bounty paid by the government on lead ore exported will cease. The St. Eugene has been getting a heavy percentage of the total lead bounty, and all of the export bounty, getting in March \$20,000. Local smelters with lead stacks are hard pressed for ore. The tonnage of the St. Eugene for the past month, except less than a fifth, went abroad—2300 tons to Germany and 800 tons to Belgium.—H. Shallenherger of Spokane, Wash., has started work on the Crescent mine, 2 miles from Greenwood.

Boundary shipments for week ending April 15 were:

Mine.	Tons.
Granby Mines.....	11,350
Mother Lode.....	2,592
Brooklyn.....	3,187
Rawhide.....	919
Mountain Rose.....	232
Oro Denoro.....	165
Winipeg.....	150
Stemwinder.....	450
Skylark.....	30
Last Chance.....	25
Total for week.....	19,050
Total for year.....	267,113

#### Lardeau District

Navigation has been opened on Trout lake, and this means a resumption of business in the Lardeau.—A Minnesota syndicate proposes driving a tunnel 4000 feet to tap the ledges of the Silver Cup, the Nettle L. and the Triune. Surveying has been commenced.—D. G. Forbes, who formerly had charge of the Silver Cup mines, has resumed his place.—Development work on the Lucky Boy is producing considerable ore. The final payment for the property has been made to J. W. Westfall and associates, who sold it to the present owners for \$16,000.—A Nova Scotia syndicate has been operating a property on Surprise creek.—O. Nelson and associates have bonded the Bonanza group for \$18,000.—The Mohican property, operated by the Cariboo Creek Development Syndicate of Rossland, will resume work when the snow melts.—At Camhorne, on the Eva group, a new body of ore has been uncovered and is being crushed in the mill.—As soon as the Great Northern Mines gets its affairs rearranged the intention is to increase the stamp mill at Camhorne from ten to twenty stamps. It will also put up a stamp mill at Poplar for the reduction of the ores of the Swede group and the Lucky Jack.

#### Rossland District

The tonnage of ore shipped from and crushed at the Rossland mines for the week ending April 15 and for the year to date was as follows:

	Week.	Year.
Le Roi.....	2,050	40,180
CenterStar.....	1,643	26,903
War Eagle.....	1,170	18,560
Le Roi Two (milled).....	400	1,600
Le Roi Two.....	120	3,353
White Bear.....	120	1,075
White Bear (milled).....	100	2,700
Jumbo.....	100	3,325
Spitzee.....	270	3,254
Velvet-Portland.....	100	1,577
Totals.....	5,753	102,357

#### Vancouver Island.

The Britannia mines, Howe Sound, will ship ore and concentrates to the Crofton smelter, Osborne bay. G. H. Robinson is managing director of the Britannia Copper Syndicate. The deal calls for the delivery of the entire tonnage of the Britannia for treatment at Crofton and is to last during the life of the Britannia. The minimum shipments are to be 250 tons per day, but it is expected that the mine will be shipping 500 tons per day as soon as it is in running order. The shipments will start about June 1 and the smelter will start about six weeks later. Crofton has a three-furnace plant capable of handling 700 tons a day. In addition it has two stands of copper converters of 1000 tons daily capacity. J. Breen will continue as head of the Crofton, and H. C. Bellinger will be consulting metallurgist for the Crofton and Yampa smelter at Bingham, Utah. The Britannia is completing its 600-ton concentrator and its 3½-mile tram. The Britannia ore and concentrates together make a self-fluxing charge.

### MEXICO.

Under the plan of currency reform in Mexico is the tariff for the collection of assay and melting dues. Silver bars of which the fineness is at the lowest 100-thousandths: For each bar weighing not more than 53 kilograms, \$1.50; for each 10 kilograms or fraction of 10 kilograms, \$1.50. Gold bars or mixed gold and silver

bars whose fineness is at least 100-thousandths: For each bar weighing not more than 35 kilograms, \$2.50; for each 10 kilograms or fraction thereof in excess, \$2.50. Pigs of lead, copper or any other metal: For every 5 tons or fraction thereof contained in the lot, \$2.50. Artificial sulphides, concentrates, mattes, ores and tailings: For each lot, according to class, including the sampling, \$3. For articles of the goldsmith's or silversmith's art: For each assay, including hall mark, \$1. Melting dues: For each kilogram or fraction thereof before melting, 10 cents. In no case will less than a dollar be charged.

Under the new mining law, which will go into effect May 1, the import duties, payable on all machinery for mining operations or for metallurgical establishments will be returned to the importers within six months from the date of the last importation. The regulations governing the return of these duties are as follows: "The ordering mining or metallurgical concern will, at least twenty days prior to the arrival of the machinery, furnish the General Custom Bureau with a general description thereof, the locality in which it is to be installed and the name of the custom house through which it is to be imported, to the end that said custom house may receive in due time from the Bureau proper notice and instructions. When the importation is effected there must be presented to the custom house the consular invoice or invoice request as may be required; a copy of the private invoice with specifications of the packer, and a plan or drawing of the machinery in question. If the definite installation of the machinery shall have been completed within six months counted from the date of the importation of the last shipment, the Department of Finance will order the refundment of the duties collected upon receipt of a report from an expert appointed by the Custom Bureau to the effect that the machinery has been definitely installed and that it is the same as that referred to in the specifications, drawings and invoices mentioned in the foregoing sections. In order to obtain exemption from duties it is not necessary that the importation should take place in a single shipment, but when once all the pieces composing the machinery shall have been imported, an operation that must always be effected through one and the same custom house and in a period of time not exceeding two months, the other loose pieces or repair pieces that may be imported separately will be subject to the respective duties without any claim to refundment."

#### Chihuahua.

W. Adams, in describing the mines of Santa Eulalia, says that the Las Animas shaft is down 225 feet. The owner, J. Aguirre y Nevares, is building the first Weher gas generating power plant on the field, with a capacity of 25 H. P. The manager of this property is C. Aguirre.—The Mina Vieja shaft is down 1000 feet; 22 H. P. gasoline engine hoist; manager, J. Mitchell.—La Esmeralda, owned by M. Gameros, P. Gomez y Campo manager, has its shaft down 125 meters; 12 H. P. gasoline hoisting plant.—The shaft of La Paracionera, Qualey Bros., is down 1200 feet; 100 H. P. plant; and Providencia shaft is down 400 feet; 25 H. P. engine and plant; J. Murray is superintendent.—The Santa Rita shaft, owned by the Chihuahua M. Co., is down 1000 feet; power supplied by compressors at Potosi shaft.—Santa Eulalia M. Co., owned by the Hearst estate; shaft No. 1 is down 1500 feet, double steam hoist, 150 H. P.; shaft No. 2 is down 500 feet, single steam hoist, 150 H. P.; shaft No. 3 is down 1416 feet, double steam hoist, 150 H. P., Mr. Everlith, manager.—Chihuahua M. Co. (Potosi, etc.) main shaft is down 1500 feet; double steam hoist; 500 H. P. shaft; No. 2 is down 800 feet; power supplied from main shaft by compressed air; manager, S. J. Sullivan.—Kansas City M. Co., Guggenheim Trust, American S. & R. Co., main shaft is down 1500 feet; 250 H. P. steam plant; manager, J. Mitchell.—Santo Domingo M. Co. (same as Chihuahua M. Co.) shaft is down 1750 feet; 250 H. P. steam plant; manager, S. J. Sullivan.—Santa Eulalia Exp. Co. is opening Buena Tierra shaft down 1000 feet by raising and sinking; now raising ore through K. C. M. Co. shaft; 100 H. P. steam engine; manager, Dr. Jackson.—The Baltimore shaft is down 1300 feet, with levels east from 1000, 1100 and 1200 feet of 200 feet each; 44 H. P. gasoline hoist; not running at present.—The Bustillos shaft is down 600 feet; 50 H. P. steam hoist; manager, J. P. Hutchinson.—San Juan, Holmes manager; one 15 H. P. plant underground on the 200-foot level, a 25 H. P. engine and plant on top; both steam engines.—El Cristo shaft cuts vein at 100 meters; 22 H. P. gasoline engine; manager and owner, L. Seijas.—The Juarez shaft cuts vein at 97 meters; 12 H. P. gasoline engine; manager, J. Gasson.—La Vergara has 22 H. P. gasoline engine; shaft down 600 feet; owner, L. Seijas.—Las Mercedes shaft is down 320 feet; 25 H. P. gasoline engine; manager, T. Sullivan; owned by the Chihuahua M. Co.—Santa Juliana No. 1 shaft is down 600 feet; 22 H. P. gasoline hoist; shaft No. 2 is down 200 feet; 12 H. P. gasoline hoist; manager, Mr. Everlith.—Nueva Santa Eulalia is owned by the Santa Eulalia Exp. Co.; shaft is down 200 feet; 22 H. P. gasoline hoist; manager, Dr. Jackson.—Iheria No. 1 has 22 H. P. gasoline engine; shaft down 200 feet; owned by Ryan & Dudley.—The San Antonio has 44 H. P. gasoline hoist; shaft down 600 feet; tunnel taps vein at 600 feet, coming from El Colon to the north; concentrating plant site and water for the same developed 1 mile northwest of main shaft.

The Lucky Joe M. Co. has made a rich strike on its property near Bachiniha, 30 miles south of Chihuahua. J. E. Case is one of the owners.

#### Jalisco.

The Las Bolas silver mine in the Cuale district has been purchased by H. L. Chlostry of Guadalajara for himself and associates for \$60,000.—H. Sahlayrolles of Zapotlan reports a discovery on the Contla hacienda, Tamazula. He is driving a new tunnel.

#### Sonora.

El Porvenir mine, 6 miles southwest of Cananea, is being worked under the direction of P. J. Tehaney.

### SOUTH AFRICA.

There were 34,350 Chinese working the mines of the Rand on April 1, 1905.



## Personal.

P. H. EDLESSEN has charge Monumental mine, near Granite, Or.

J. H. MYERS has returned to Denver, Colo., from Chicago, Ill.

W. T. NASSAUER is manager Whitman M. Co. at Pearl, Idaho.

T. P. LAMB is superintendent New Jersey mine, at Chlorido, Ariz.

J. C. GREENWAY is superintendent Oliver Iron M. Co. at Bovey, Minn.

C. S. GALLOWAY has charge of work on the Fremont at Providence, B. C.

J. W. RIGGLE is superintendent Black Butte Extension mine, Goldfield, Nev.

C. WILSON is superintendent Roosevelt group near Vivan, Mohave Co., Ariz.

G. OSWELL has been appointed superintendent Midway mine, near Sumpter, Or.

E. STALKNECHT is superintendent Gibosa mine near Jimenez, Chihuahua, Mexico.

C. A. HEBERLEIN is manager Alma M. & M. Co. at Zacatecas, Zacatecas, Mexico.

JOHN LIDDELL, superintendent Gleeson mine, at Iowa Hill, has gone to Sierra City, Cal.

C. M. COLLINS is superintendent Arps Bros.' group, Red Mountain, near Ouray, Colo.

E. H. BACKUS, an owner of the Columbia mine at Bourne, Or., has been at the mine.

M. LINDLEY is manager Shasta May Blossom mine, near Winthrop, Shasta county, Cal.

W. PARISOT, manager Atlas mine at Buffalo Hump, Idaho, has been at Spokane, Wash.

W. ROBINSON has been appointed superintendent Silver Shield mine at Bingham, Utah.

J. H. ENGLISH has been elected superintendent Spanish Ridge mine, near Washington, Cal.

B. F. PETERS has charge Juanita and Bonnie Belle group, 16 miles southeast of Prescott, Ariz.

H. A. MEGRAW of Baltimore, Md., has been appointed manager Montgomery M. Co., Candor, N. C.

THEO. VAN WAGENEN arrived in London, en route to California, from South Africa on the 8th inst.

J. M. DAY of San Francisco, Cal., has been at his mines at Gold Road and Vivan, Mohave Co., Ariz.

L. W. TRUMBULL has been appointed consulting engineer Strong Copper Co. of Laramie and Leslie, Wyo.

J. A. FULTON has been appointed assistant manager Sky Blue M. Co. in the East Rand district, South Africa.

HARRY LA MONTAINE, manager Sultan M. Co., near Hillside, Ariz., has returned to the mine from a trip East.

N. C. BONNEVIE has returned to Denver, Colo., from a trip through Idaho and Washington on professional business.

E. GRAHAM of the Southern M. M. & D. Co. at Silver Plume, Colo., is in Nashville, Tenn., on two months' business.

PRESIDENT S. L. BUTLER, Pioneer Sampling Co., has appointed C. D. Rookledge as general manager at Salt Lake City, Utah.

E. J. BONESTELL and E. C. HUNDLEY, Sutter Creek, Cal., have been appointed shift bosses at the Darien mine, Darien, Panama.

J. M. BLYTHE, secretary F. M. Davis Iron Works Co., is in Los Angeles and other California points on business connected with his firm.

CLARENCE LAWSON, the manager of the J. Geo. Leyner Engineering Co. of Denver, Colo., is in San Francisco, Cal., with his family.

PRATT, VANDEMOER & WARBURTON, mining, mechanical and civil engineers, have opened an office at 522 McPhee Building, Denver, Colo.

W. W. NORTON, superintendent East Helena, Mont., smelter, has been appointed superintendent Murray smelter at Salt Lake City, Utah.

W. J. KEOUGH, formerly superintendent Red Boy mine, near Granite, Or., has been appointed superintendent Minerva M. Co., Atlanta, Idaho.

C. H. MCMAHAN has resigned as superintendent Montezuma Lead Co. of Santa Barbara, Chihuahua, Mex., to devote his time to private interests and engineering practice in El Paso, Texas.

E. B. MILLER has resigned as superintendent Spanish Ridge mine, near Nevada City, Cal., to take the superintendency Mountain View mine, near Washington, Cal. He is succeeded by J. H. English.

LAST WEEK it was erroneously stated that Alfred von der Ropp had resigned the superintendency of the Selby Smelting & Lead Co.'s works at Vallejo Junction, Cal. The MINING AND SCIENTIFIC PRESS is pleased to state that such is not the case.

H. C. BELLINGER, who retired from the superintendency Yampa smelter in Bingham Canyon, Utah, has gone to Spokane, Wash., where it is reported he will enter the service American Smelting & Refining Co., by which his skill has been long sought.

THE following officers have been re-elected by the Colorado Mine Operators' Association: President, F. J.

Campbell of the Vindicator Con. M. Co., Cripple Creek; secretary, W. E. Pasmore, Denver; executive committee, E. A. Colburn of the Ajax M. Co., Cripple Creek; R. L. Martin of the Gregory-Buel Con. M. Co., Central City; T. W. Beam of the Japan M. Co., Telluride.

## Books Received.

"Origin of Certain Place Names in the United States," by H. Gannett, Bulletin 258 of the United States Geological Survey.

The United States Geological Survey has issued "Forest Conditions in the Gila River Forest Reserve, New Mexico," by T. F. Rixon; "Lignite of North Dakota and its Relation to Irrigation," by F. A. Wilder, and the Fayetteville Folio of Arkansas and Missouri.

The Department of Geology of the University of California in its fourth volume has issued "The Geology of the Upper Region of the Main Walker River, Nevada," by D. T. Smith; "A Primitive Ichthyosaurian Limb from the Middle Triassic of Nevada," by J. C. Merriam; "Geological Section of the Coast Ranges North of the Bay of San Francisco," by V. C. Osmond; "Arcas of the California Neocene," by V. C. Osmond, and "Contributions to the Paleontology of the Martinez Group," by C. E. Weaver.

The effect of the popular demand on book production is well exemplified in the recent additions to the literature on cement and concrete, a number of which have been reviewed recently in these columns. The latest received is "Cement and Concrete," by L. C. Sabin. This differs from most of the preceding treatises in giving the results of much original research. It is essentially a book for the user, and not for the manufacturer, of cement. In fact, as compared with recent practice of manufacture on the Pacific coast, the methods described seem sadly out of date. The treatment on physical tests is exceedingly good, giving also much material on the results of tests. The tables of actual quantities required in making up different mortars are complete for some special cement, but will probably have to be modified by a constant for other makes. The lack of illustrations is noticeable. On the whole, the book is comprehensive and apparently accurate. It lacks a few details on costs and practical work, which probably can best be supplied from the reader's own experience. It is published by the McGraw Publishing Co., 114 Liberty street, New York City, for \$5, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of cost.

## Commercial Paragraphs.

R. D. SEYMOUR, manager Denver, Colo., branch The Trenton Iron Co., reports the removal of his office from 1711 Tremont street to 237 Equitable building, Denver.

STROMBERG-CARLSON TEL. MFG. CO. report that they have recently received an order for mine telephones from the Jupiter G. M. Co., Germistown, Transvaal, South Africa. Some of these telephones are to be worked in shafts 4300 feet in depth.

A. E. LINDROOTH, SHUBART & CO., Denver, agents for the Goodman Manufacturing Co., have closed contracts with the Colorado Fuel & Iron Co. for the installation of the Morgan system of third rail haulage at the Fremont mine. This is to operate on the main haul with a grade of 5½% against the loads. The Link-Belt Machinery Co. of Chicago, through their agents, A. E. Lindrooth, Shubart & Co., are building shaking screens and tippie equipment for the Colorado Fuel & Iron Co.'s Coal Creek mine. The Raton Coal & Coke Co. have started their new washery at Gardner, N. M. Designs were made by A. E. Lindrooth, Shubart & Co. of Denver, who also equipped the plant. The conveying machinery was furnished by the Link-Belt Machinery Co., the jigs by the American Concentrator Co., and the engine by the Goodman Manufacturing Co. The Dawson Fuel Co. has recently adopted the New Century jig for coal washing. The order was placed with A. E. Lindrooth, Shubart & Co. of Denver, who are Western agents for the American Concentrator Co.

THE C. O. Bartlett & Snow Co. of Cleveland, Ohio, under date of April 13th, write: "We met with a severe loss by fire on the 11th of April. The fire broke out about 12:30 A. M. and almost immediately spread throughout the main buildings. Thirteen fire engines and two fire boats responded to the call. Our main buildings were badly damaged. The office buildings were not much damaged and our boiler and engine were not badly injured. Our greatest loss was in patterns. The largest part of our machinery was not seriously injured. We have immediately commenced to get our buildings in shape and expect to start up in the machine shop department next week and in our boiler shop within two weeks. The Ohio Ceramic Co., the McMyler Mfg. Co., the Bowler Foundry Co. and the Cleveland Gas Light & Coke Co. and others have kindly offered us the free use of some of their tools; therefore we will be able to complete our contracts and fill our orders with little delay. We ask that our patrons and friends be a little patient with us, assuring them that the delay will not be long. We can fill small orders from stock which was not damaged."

THE Fred. M. Prescott Steam Pump Co., Milwaukee, Wis., report orders from the Pewabic Co., Iron Mountain, Mich., one triple-expansion mine pumping engine, capacity 1500 gallons per minute against a vertical head of 1000 feet; from the Copper Queen Con. M. Co., Bisbee, Ariz., one compound and condensing mine pumping engine, capacity 600 gallons per minute against 1250-foot head; from the American Smelting & Refining Co., Omaha, Neb., one duplex pot-form converter pump,

capacity 250 gallons per minute against a pressure of 500 pounds per square inch; from the Calumet & Pittsburg M. Co., Bisbee, Ariz., one independent air pump and condenser, capacity 20,000 pounds steam per hour; from the Union Electric Light & Power Co., St. Louis, Mo., two horizontal, duplex pot-form boiler-feed pumps, each with a capacity for feeding 30,000 H. P. of boilers. The Prescott Steam Pump Co. state that these are the largest pumps of this type which have been built or installed in any electric light or railway power plant in the United States. They also report an order from the Milwaukee Light, Heat & Traction Co., Racine, Wis., for one independent air pump and condenser with a maximum capacity of 20,000 pounds steam per hour.

## Latest Market Reports.

SAN FRANCISCO, April 21, 1905.

### METALS

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, 64c; bar silver, 56½c, refined (1000 fine); San Francisco, 56½c; Mexican dollars, 46c, San Francisco; 4½c, New York.

COPPER.—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15.25@15.25; Electrolytic, 1 to 3 casks, \$15.75; Casting, 1 to 3 casks, \$15.00. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £66 17s spot per ton.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 10s 6d per long ton.

SPELTER.—New York, \$6.00; St. Louis, \$6.15; London, £24 ½ ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.40@30.60; San Francisco, ton lots, 32c; 500 lbs., 31½c; 200 lbs., 32c; less, 33c; bar tin, 34½c, 35@37½c. London, £135 10s.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20c; San Francisco, Plumbers', 100-lb. lots, 16.75c.

ZINC.—Metallic, chemically pure, 7½ lb., 50c; dust, 7½ lb., 10c; sulphate, 7½ lb., .04c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 13@12c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Lined, boiled, bbl., 60c; cs., 65c; raw, bbl., 58c; cs., 63c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As;



tral, 19c; Star, 19c; Extra Star, 22c; Eocene, 21c, Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c, do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphta or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c ½ lb; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ½ lb; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ½ lb.

MOLYBDENUM.—Best, \$2.75 ½ lb.

CHROMIUM.—90% and over, ½ lb., 80c.

PHOSPHORUS.—American, ½ lb., 70c.

SODIUM.—Metal, ½ lb., 50c.

BISMUTH.—Subnitrate, ½ lb., \$2.10.

URANIUM.—Oxide, ½ lb., \$3.50.

MERCURY.—Bicbloride, ½ lb., 77c.

TUNGSTEN.—Best, ½ lb., \$1.25.

SILVER.—Cbloride, ½ oz., 90c@\$1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ½ lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Black oxide, ½ lb., 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads ½ 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, ½ ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

### New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING APRIL 11, 1905.

787,258.—ELEVATOR—F. B. Austin, Tomshstone, Ariz.  
786,948.—BALING PRESS—W. S. Bradshaw, San Jose, Cal.  
786,954.—PICTURE EXHIBITOR—R. Cohen, S. F.  
786,956.—BOX MAKING MACHINE—W. Corkhill, Corona, Cal.  
787,287.—PRESSURE REGULATOR—G. H. Dworzek, S. F.  
787,088.—NUT LOCK—T. B. and M. F. Earhart, Stockton, Cal.  
787,292.—DYNAMO—T. B. Hatch, Los Angeles, Cal.  
787,098.—HAT HOLDER—M. S. Helman, Los Angeles, Cal.  
787,294.—BILGE BLOCK—J. Hickler, Pasadena, Cal.  
786,900.—STOVEPIPE FASTENER—R. H. and W. C. Hodge, Medford, Or.  
786,968.—SPUD GRIP—J. W. Hollenbeck, Rio Vista, Cal.  
786,967.—STAMP STEM GUIDE—F. W. Hooper, Grass Valley, Cal.  
787,045.—OIL BURNER—Kipling & Worden, Los Angeles, Cal.  
787,208.—SADDLETHROW—T. J. Morrish, S. F.  
786,988.—STREET CAR REGISTER—F. Paduvert, S. F.  
786,860.—FENCE POST—H. F. J. Slevierkropp, Hood River, Or.  
786,853.—PUNCHING MACHINE—E. A. Stickney, Sacramento, Cal.  
787,129.—GATE—J. E. Stinton, Monroe, Wash.  
787,237.—UMBRELLA—G. Turner, Tacoma, Wash.  
787,344.—PUMP—D. M. Watson, Portland, Or.  
786,928.—GAS LIGHTER—A. F. Williams, Berkeley, Cal.  
787,018.—PLOW SCRAPER—W. O. Wimer, Portland, Or.

### Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s Scientific Press United States and Foreign Patent Agency, the following are worthy of special mention:

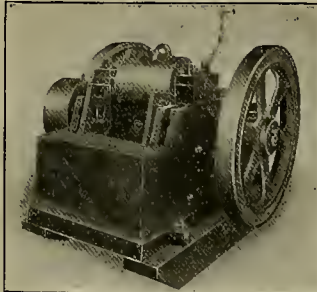
SPUD GRIP FOR DREDGERS, ETC.—No. 786,968. April 11, 1905. J. W. Hollenbeck, Rio Vista, Cal. This invention relates to an improved grip for the spuds of dredgers, pile drivers and the like. The object of the invention is to provide a durable, powerful, practical grip, which will invariably take a firm hold on the spud and will not slip, which will not cut or destroy the spud, and which shall be simple and

can be quickly applied. The device comprises two hinged yokes, a shoe carried by the hinge, a hearing plate opposed to said shoe and supported by one of the members and interposable within the other member when the two are engaged with an object to be gripped, and other necessary details of construction.

STAMP STEM GUIDE.—No. 786,969. April 11, 1905. F. W. Hooper, Grass Valley, Cal. The object of this invention is to provide a comparatively light, simple, easily adjusted metal guide with means for preventing relative longitudinal movement of the sections of the boxes in which the stems slide, the boxes being securely held in the guide without bolts or other independent fastenings. The device comprises a casting having a tapered socket and an opening in one side of the socket for the admission laterally of a stamp stem, and a sectional guide block seating in said socket, the sections of said block having their shutting edges inclined relative to the axis of the bore, and other details of construction adapted to bring about the desired result.

BALING PRESS.—No. 786,948. April 11, 1905. W. S. Bradshaw, San Jose, Cal. The object of this invention is to provide a novel, simple, safe, positive and practical means for opening and closing the door of a haling or hay press. It consists in the combination of a press box, a follower therein, a door for said box, a sweep, a rock shaft, toggles having one member fixed to the shaft and the other pivoted to the door, fast pulleys on said shaft, door closing means including flexible connections between one of said pulleys and devices operated by the sweep, door opening means including flexible direct connections between the other of said pulleys and the follower, and an expansion spring interposed in said door closing flexible connections for the purpose specified.

STREET CAR REGISTER PROTECTOR.—No. 786,988. April 11, 1905. F. Paduvert, San Francisco, Cal. The object of this invention is to provide a protective device which will be operated simultaneously with the registering mechanisms and announce to the eye and ear the actual record if any made by the conductor. It consists in a protective device comprising a casing including two operating levers, two other levers in the path of said operating levers and arranged each to be operated on the oscillation of either of the operating levers, two bells of different tone quality, hammers relative to said bells, means carried by said second levers to operate said hammers, and visible signal mechanism operable by said other levers, said signal mechanism including semaphore arms normally disposed in the path of said other levers, spring detent means to hold either semaphore in exposed position and means for retracting a detained semaphore, and other details of construction.



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# MINING AND SCIENTIFIC PRESS

Whole No. 2336.—VOLUME XC.  
Number 17.

SAN FRANCISCO, CAL., SATURDAY, APRIL 29, 1905.

THREE DOLLARS PER ANNUM  
Single Copies, Ten Cents.

## Development in New Regions.

Five years ago southern Nevada attracted little attention as a region of great though undeveloped mineral resources. The mines at Good Springs, Searchlight, Johnny and Quartette in southern Lincoln county were known, and some rather desultory work was in progress. Many stories were current of phenomenal finds by the prospectors who crossed the desert in early days, among them being the Breyfogle and Gunsight mines—discoveries reputed to be of fabulous richness, but of indefinite location, as the alleged discoverers were never again able to find the rich veins. The discovery of the Tonopah veins gave the first substantial impetus to the development of that section of the county, and then rapidly followed the discovery of Gold Mountain, Crater, Ray, Lone Mountain, Goldfield, Bullfrog, Lida, Kawitch or Goldreed, and a number of other, but as yet, lesser camps, until to-day southern Nevada is one of the most active mining fields in the world. The discoveries made at Tonopah, Goldfield and Bullfrog lend a color of truth to the stories told by the pioneers who came into California from Utah by way of Death valley in the early days, for none of the reported discoveries of those times can compare with the actual results obtained at the surface of the ground in Goldfield district within the past year. The old stories were of iron-stained quartz in which could be seen free gold running hundreds of dollars per ton, but none of the argonauts told of desert sand nearly half gold, as was found in a few instances at Goldfield, as on the Sandstorm and some other claims, where the fortunate discoverers shoveled up the surface soil, rejecting the roots of the greasewood, which were burned and their ashes added to the pay dirt, and the bedrock swept as clean as a floor to obtain the last grain of the precious gold. These are the kind of strikes that have developed other



Tipple and Washer, Victor Fuel Co., Hastings, Colo. (See Page 266.)

regions, even more unfortunately situated than these camps of southern Nevada. Kalgoorli, Coolgardie and most of the other now noted mining towns and districts of Western Australia were far worse to invade than ever was southern Nevada. Nearly 400 miles from the coast, and almost that far from fresh water, except during the infrequent rains, yet after the discovery of Baley's Reward mine, at Coolgardie, thousands of venturesome prospectors rushed into that desert of bush and sand, and far more men perished from heat, disease, lack of water and exposure than has ever met a similar fate in all of the southwestern part of the United States under similar conditions. A noted miner and prospector made a "trip of discovery" in 1862 for the Government, passed over the Coolgardie field and then wrote a report entitled "The Non-Auriferous

Character of the Rock of Western Australia." In 1869 the Australian Government offered a bonus of \$25,000 to the prospector who would discover a gold mine within 300 miles of the west coast of Australia. In 1873 a number of miners from Ballarat were taken to Western Australia to prospect, and before anything of consequence had been discovered a stamp mill was built in anticipation of the result. The entire enterprise ended in failure. The first discovery of note was made in 1885 at Kimberley and 2000 men rushed into that field, and Southern Cross was discovered in 1887 as a result of the Kimberley find, in much the same manner as the Goldfield discovery was the result of that of Tonopah. Before 1891 several new fields were reported over a widely scattered region. In 1891 Bayley and Ford discovered Coolgardie and in a few days had picked up from the surface of the ground nearly \$15,000. Following this discovery came the greatest rush of those times. Kalgoorli was discovered in 1893.

There is no great difference in the character of events leading to the development of Western Australia and the great basin of the southwestern United States, aside from the bonus offered by the Government. The same idea, the same desire—to quickly accumulate a fortune—has actuated men in both instances, and, in fact, in every instance where there is a stampede to a new mining district. In these strenuous efforts there is much of the element of chance, for it is usually the lucky one who makes the best finds. In the case of Goldfield there are numerous instances of men working diligently on their leases and finding little or nothing, and quitting to try another place, when a rich find is made in a comparatively small area between two of the trenches cut by the former occupant of the lease. It is not exactly a survival of the fittest, for the fittest often fails to "make a hit" with fortune in the strenuous life of a new mining camp, whether in the deserts of Australia, the great basin, in the region of the poles, or in the most favored mining country on earth. Some of the most valuable discoveries have been the result of fortuitous circumstance, unexpected by the fortunate prospector, but they who hope for the smile of Dame Fortune must seek it.



Headframe South Eureka Mine, Amador County, Cal. (See Page 268.)



South Eureka Mill, Amador County, Cal. (See Page 268.)



Headframe Central Eureka Mine, Amador County, Cal. (See Page 268.)



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THE engineering difficulties to be overcome in coal and metal mining are numerous and varied in character, but they are not more difficult than those arising in the construction of metropolitan subways, aqueducts and other works of public character which are usually at or near the surface. One does not have to go a thousand feet underground to encounter serious difficulties in rock excavation, and the supporting of tunnel roofs, or to carry on superficial excavation while doing little or no damage to existing surface improvements and obstructing traffic as little as possible, such, for instance, as were encountered in the New York subway, and few mining operations require such skill and daring as that which engineered the tunnel under the Hudson river connecting New York and New Jersey.

AT Broken Hill, New South Wales, during the half year ending November 30 last, the output of the Broken Hill Proprietary Company was about 324,500 tons of ore the cost of mining, transportation, reduction and other charges being £577,322, or about \$8.75 per ton of ore treated, the output in metals consisting of gold, silver, copper, lead and zinc, and as a by-product a considerable amount of sulphuric acid. It is stated to be the intention of this progressive company to enter the market as manufacturers of spelter from its own ores. Until the past year or two these zinc ores in the Barrier field have been a drawback and source of expense, but now, owing to changed conditions, the zinc is yielding a good profit, in the same way that this once despised ore has now become a source of dividends to many American mines.

## Cost of Mining.

Amador county, California, has developed the deepest and most extensive mines on that great mineral belt commonly called the Mother Lode. Nearly all of the mines now working on this lode in Amador county are more than 2000 feet in depth, the Keystone at Amador City being a noted exception, the greatest depth reached there being 1575 feet, though the greatest development is above the 1000-foot level. Where such deep mining prevails and is carried on so extensively as in this district, the figures of cost are of more than usual interest to mining men everywhere. It is realized that the items which go to make up the cost of mining are largely influenced by existing conditions, as well as by the competency of the management. Generally speaking, on the Mother Lode, in Amador, the ore shoots occur in the vicinity of clay, slate and amphibolite schist, both usually being present, though the deposits are not, strictly speaking, contacts. In part they are such, but more often the fissure cuts diagonally across the slates and schists at a low angle, in both strike and dip. Heavy gouges and swelling ground are characteristic features, and these add not a little to mining expense, chiefly in supporting the ground and in renewing timbers. In many respects the mines, from the Bunker Hill on the north to the Argonaut on the south, a distance of nearly 6 miles, have similar characteristics, though with many important differences. In some of the mines the ground is much broken, faulted and disturbed, resulting in heavy ground, and generally adding much to the cost of deadwork. All of these mines, with the exception of the Argonaut, have their original shafts sunk in the fissure, and in this district can be seen an object lesson which teaches that it is economy to sink shafts in the hard country rock rather than on the fissure. The Argonaut shaft is an incline and was sunk largely in the country rock. The Kennedy and Oneida have vertical shafts down about 2700 and 2300 feet respectively, and the Wildman has a vertical shaft down 650 feet which is projected for 4000 feet. These vertical shafts were sunk at a cost approximating \$60 per foot, nearly double the cost of sinking the inclines in the fissure, but it is estimated by the several superintendents that the cost of maintaining these inclines in the heavy fissures is from \$6000 to \$10,000 per annum—no small item in the operation of a low-grade mine. A vertical shaft 2000 feet deep would cost, according to the above figures, \$120,000, and an inclined shaft to the same level—about 2300 feet at 63°—would cost about \$90,000. The surface plant in either case would be about the same. This shows an advantage in first cost of the inclined shaft over the vertical shaft of about \$36,000 to reach a vertical depth of 2000 feet, but at an average cost of maintaining a working shaft in the heavy swelling ground of about \$8000 per year, the real advantage of the vertical shaft in firm, hard ground is at once apparent.

Seldom is one of these deep inclines sunk without suspending sinking to carry on stoping operations from level to level, but where the shaft has been carried down rapidly it is not possible to sink 1500 feet without making more or less repairs to the shaft in that portion first finished near the surface, and as time goes on the entire shaft requires careful and almost constant attention from a repair gang of several men. Not only is such a shaft a source of constant direct expense, but it is the occasion of other expense incidental to operations being retarded by reason of such a shaft. The vertical shafts already sunk have, with few exceptions, cost very little for repairs since they were first sunk. Some of these have been in use now from eight to twelve years, and are still in good condition, costing comparatively little for repairs, and have long since repaid the additional cost of sinking. It is necessary to maintain openings in the vein from the lowest level to the surface in all of these mines, but the placing of the main working shafts in the fissure is a practice which should be discontinued. The Central Eureka mine, near Sutter Creek, is a typical mine of that section, and though in some respects more fortunate than some of its neighbors, it still affords an excellent example of the cost of practical mining operations on the Lode in Amador. In this mine, during the year ending April 1, 1905, about 60,000 tons of ore were raised all from depths

ranging from 1900 feet to 2300 feet through an incline shaft sunk on the fissure. The deadwork and development account during the period covered by the report was but \$22,686, or about 37.5 cents per ton of ore treated. An equal sum covered the cost of milling, the cost of mining being \$1.41 per ton, or a total cost per ton of \$2.175 for all expenses. These charges do not include deterioration of plant, but the showing made is a good one and gives a fair idea of the cost of mining under the conditions existing there.

## Must Use Protected Cages.

The State Legislature of Nevada recently passed a law requiring that any shaft in that State more than 450 feet in depth shall be provided with a cage over which shall be fixed a steel hood, for the protection of the men riding on the cage, and that in all shafts less than 450 feet deep, where bucket and crosshead are in use, a platform must be provided for men to stand upon while being lowered or raised in the shaft, and further, that this platform be placed above the crosshead. The text of the bill is not at hand, but the newspapers of that State agree in reporting the requirements of the bill as above stated. This bit of mining legislation bears the earmarks of being the work of some one who is not well acquainted with practical mining, for it conveys the impression that the choice of a cage or skip is not optional with the management of a mine deeper than 450 feet, and that cages must be used in all such mines. It is often the case in modern practice to use automatically dumping skips in mines for the reason that their employment admits of handling ore and rock at less cost than is usual with cages. Skips in well regulated mines are equipped with steel shields overhead for the protection of the men. Accidents arising from the employment of crossheads are of rare occurrence, and when they do happen, are usually the result of overwinding or some other act on the part of the hoisting engineer, through carelessness or through inability to control engines for the time being. There have been instances where a crosshead has caught on the guides, where the crosshead was too short and has hung suspended there while the bucket continues to descend, and then, suddenly becoming released, has fallen and knocked the men riding on the chine of the bucket into the shaft; but this is also of very infrequent occurrence and may be prevented by the use of proper length and form of guide shoes. The placing of a platform above the crosshead must necessarily contemplate a structure similar to a cage, which, having shoes running in guides, renders a crosshead unnecessary.

It is a common practice to place a bucket beneath a cage for the purpose of sinking, the bucket being from 15 to 20 feet below the platform of the cage, to which it is attached by a short section of cable or a chain. While it is the duty of legislative bodies to protect the citizens of the State in every walk of life, it seems unfortunate that some of these acts are of a character which will not bear common sense investigation.

TALK of anticipated labor troubles comes from the staid old tin mines of Cornwall, where it is stated that the machine men employed show much "indifference" as to the amount of work accomplished, notwithstanding the "inducements" offered by the mine managers. What the inducements referred to were is not stated, but the managers say the time has arrived when the question must be settled whether "the mines shall keep the men working, or the men keep the mines working." The average wages earned by machine men in a noted Cornish tin mine is stated to be about \$37.50 per month, ranging from about \$25 to \$55 per month.

THE law passed by the last California Legislature making it unlawful to misrepresent anything concerning the property of any incorporated mining company in that State has been in force too short a time to make it possible to say what its general effect will be on the organization and promotion of new mining enterprises. If strictly observed, it will have a tendency to make some mining prospectuses rather tame reading, compared with what they have usually been in the past.



## CONCENTRATES.

THE Dominion of Canada during 1904 produced minerals to the value of \$60,000,000. This includes non-metallic as well as metallic products.

THERE are numerous devices for automatically dumping ore buckets and cars. The latter are usually dumped on some form of balanced track section, known as a tipplo.

COPPER in ores usually gives more or less trouble in cyanidation for gold. Particularly is this the case with the oxidized ores such as oxides, carbonates and silicates of copper.

THE standard measure of the value of an electric volt is a voltaic cell, called the Clark cell, the electro motive force of which is 1.434 volts at a temperature of 15° C. (or 59° F).

COARSE FREE GOLD is of common occurrence in mispickel (arsenical pyrites). In some mines the occurrence of this mineral is an indication of the proximity of pockets of gold.

STEAM SHOVELS are extensively used in mining in the open workings of the iron mines of the Minnesota and Lake Superior iron mines, and to a limited extent underground also.

WHEN a shaft is sunk vertically to a vein having a dip, a curve should be put in, the radius of which will admit of running skips on the curve without shock or necessitating a slackening of speed of the skip.

THE cost of mining and milling at a prominent mine on the Rand—the Van Ryn—is stated to be a few cents under \$5 per ton, but this is not an absolute criterion of the cost at other mines in that district.

It is usually much less expensive to break up a boulder with small quantities of dynamite by what is known as bulldozing than to dig boles at one side of the boulder and dumping it into the hole to get rid of it.

THE caving system of mining is not always adaptable to the conditions. Where this system has been employed the geological conditions are peculiarly favorable to it, but it cannot be applied in every case to advantage.

WHEN an ore shoot is being stopped development should be in progress elsewhere in the mine, and waste from this dead work should be used as filling wherever possible, instead of raising it to the surface, as is commonly done.

It is said that the ores of Republic, Wash., can be treated successfully by concentration and cyanidation of the tailings. These ores have proven very refractory to treatment. The statement above made, it is said, is based on laboratory experiments.

A TROMMEL set with a slope of 3 inches to the foot and carrying a lighter load will usually have higher capacity than one set at 1 inch to the foot and carrying a heavy bank of ore. The latter also requires more power and the wear and tear is much greater.

TO HAVE good concrete the materials must be thoroughly mixed both dry and wet, and then when placed in position, in the wall, or elsewhere, it must be tamped carefully or there will be numerous open spaces which weaken the structure. Tamping should be continued until water rises to the surface.

THE magnitude of hydraulic mining operations must be determined by the amount of water and head available for the purpose. The factor of grade for dump is a most important one. If all other conditions were favorable, the work would be handicapped if there was not sufficient fall to carry away the tailings.

IT is stated that at the La Grange hydraulic mine in Trinity county, Cal., from 10,000 to 12,000 cubic yards of gravel are hydraulicked daily. The flume is 6 feet wide, over 1300 feet long, and paved with steel riffles made from 40-pound steel T-rails. Boulders pass down this flume weighing as much as five or six tons.

FOREHEARTHS are used at copper furnaces and are employed to receive the molten matte, or metal, directly from the furnace as fast as formed, and where any difficulties or irregularities may be promptly discovered and remedied. The forehearts in use at the large plants have a capacity of several tons of molten metal.

THE pressure of a blast created by a fan or blower is measured by what is known as a pressure gauge. The gauge is connected with the blast pipe by means of a rubber hose, and the amount of depression of a column of mercury in the gauge registers the pressure of the blast. A somewhat similar gauge is employed in mines to measure the force of air currents.

WHERE square-set timbers are employed sills should

always be laid in order to facilitate connection from the level below. The sills should also be covered with heavy lagging to hold the filling, and tracks should be laid on top of the sills, lagging being dispensed with on the sill floor. For the best economic results, provision must be made for the connecting of levels without the loss of ore.

ALTHOUGH the gravel of river channels is not usually looked upon as a productive soil after washing, many of the large pits excavated by hydraulicking in early days are now covered with a growth of pine, cottonwood and other trees, beside brush. In time, no doubt, soil will accumulate on these lands and the pits become fertile garden spots.

FLAT HOISTING ROPES are made of a number of small ropes laid side by side and sewed together with annealed cast steel wire. These several ropes are alternately right and left-hand twist, and are composed of four strands, having neither hemp nor wire centers. The number of wires in each strand varies, but is usually either seven or nineteen wires. Some mines make their own flat ropes.

A NEW FEATURE has recently been introduced into the tests to which certain materials are subjected—that of impact. It has long been the custom to test for tensile strength, bending and shearing strength, but there has been little attention given to determining the resistance of materials to shock produced by impact. This test is now applied by a machine devised for this purpose. It is done by means of a falling weight, the force of the blow being registered automatically.

IT is not improper to build powder magazines underground, but they should not be made in the mine workings. There are many accidents recorded of explosions of magazines in mine workings. If the magazine is to explode it is far better to have the explosion occur on the surface or in a special magazine built in a superficial excavation. The magazine must be dry, well ventilated and of even temperature at a point at least 20° above the boiling point of dynamite, which is about 45° F.

ORDINARILY carbon and nitrogen do not combine, but if these two elements be highly heated in the presence of a metal, they combine, forming what are known as cyanides. If a current of nitrogen be passed over a highly heated mixture of potassium carbonate and carbon, cyanide of potassium results (KCN, also written KCy). Carbon which contains nitrogen, such as animal charcoal, when ignited with potassium carbonate, reduces the carbonate, forming potassium, in presence of which carbon and nitrogen combine, forming cyanide of potassium.

A MONTEJUS is a chamber filled with compressed air, similar to the receiver of an air compressor, and is employed in forcing slimes into filter presses. A vacuum chamber is the reverse of the montejus, and is used to aid the passage of solution through a filter. Sometimes the vacuum chamber is placed beneath the filter bed. When the charge has been leached sufficiently, the vacuum pump is started and the solution, or as much of it as possible, is drawn through the filter covering the bottom of the leaching tank, the passage of the solution being accelerated by atmospheric pressure.

CONCRETE was used in the Aspen railroad tunnel in Colorado, on the Union Pacific. The greater part of it was supported by timbers, placed 3 feet center to center, but a portion of the ground was very heavy and in this steel supports made from curved steel I-beams were used and the space between and around them filled with concrete, the inner flange being buried behind 7 inches of concrete. The concrete wall was from 2 to 3 feet in thickness. There are often places in mining work where concrete may be used to advantage to stop the flow of water or foul gases as well as to support heavy ground.

MISFIRES are due to many causes, among which are defective fuse, damp exploders, chilled nitro-powder, cut-off holes and failure to properly "spit" the fuse. Defective fuse and cut-off holes are the most common. It is difficult to avoid altogether the missed hole, for the defects in the fuse are not anticipated or known, and the cut-off hole is the frequent result of shooting a number of holes at the same time, though not simultaneously. Dampness of the caps can be guarded against by keeping them in a proper place. Neither fuse nor caps should be kept underground in quantity, as they always suffer deterioration in the mine.

ELECTRICITY is measured by devices known as voltmeters and ammeters. They are provided with a coil of fine wire through which the current, or a proportional part of it, passes. This wire is attached to a needle or pointer which is suspended between the poles of a permanent magnet and is controlled by two spiral springs, which have a tendency to keep the needle at the zero mark. When a current is passed through the coil, an electro-magnetic torque, which is greater or less according to the force of the current passing through the coil, is established, so that coil and needle are caused to turn against the torque of the springs. The arc over which the needle passes is determined by the current passing through the springs. The principle upon which voltmeters and ammeters work is similar, but the resistance of the circuit of the voltmeter must be very high,

as it receives the full pressure of the circuit to be measured. The ammeter receives the full volume of the current and its resistance must be low.

UNDOUBTEDLY gold is distributed throughout the gravels and soils of the Sacramento valley, California, and to a less extent in the San Joaquin valley, but for the most part this gold is so fine and occurs in such small amount as to give no commercial value to the gravels and soils. The dredging area will be confined chiefly to the vicinity of the mouths of ancient rivers which emptied into the valleys, and also to the modern streams. There are large areas of these gravels, much of which have not yet been tested in any manner. Some of these gravels form hills and knolls of considerable extent, and will have to be excavated dry, if at all, and the gravel conveyed to the nearest water available for washing.

THE rate of increase of temperature in underground workings is very irregular, and from the large number of observations made on the Comstock lode of Nevada, the deep workings of the Mother lode of California, the deep levels of the Rand, in South Africa, and those of Bendigo, Australia, the indications are that the temperature is largely influenced by local conditions. The rate of increase varies in different mines, being from 38 feet for each degree as in one of the Bendigo mines (supposed to be due to poor ventilation), to 200 feet and over in numerous American mines. The hottest places in the Comstock mines, which are probably the hottest in the world, are not always at the deepest points reached, but near large flows of hot water.

THE law requires the discovery of mineral-bearing rock in place as a prerequisite to location of a mining claim. Mineral does not always outcrop in plain sight, and the prospector is sometimes obliged to search for it by digging. In this connection Justice Miller decided in *Crossman vs. Pendry* (8 Fed., 693) that "a prospector on the public mineral domain may protect himself \* \* \* while he is searching for mineral. His possession, so held, is good as a possessory title against all the world, except the Government of the United States. But if he stands by and allows others to enter upon his claim and first discover mineral in rock in place, the law gives such first discoverer a title to the mineral so first discovered, against which the mere possession of the surface cannot prevail."

WHEN the term "load" is used in connection with hoisting operations in mines, the total load is usually meant, as distinguished from the net load or amount of ore or rock hoisted. The total load comprises weight of rope, cage or skip, and the material being hoisted—rock, ore or water. In deep mines the weight of rope often is greater than that of all of the balance of the load. A rope, 1½ inch diameter, hoisting from 3000 feet, weighs about 7350 pounds and a 7-inch flat rope, ½ inch thick and 3000 feet in length weighs over 17,000 pounds—so that the weight of rope is an important factor in calculating the size of a hoisting engine required to hoist a given "net load," and particularly in deep shafts. Even when skips are run in balance the initial load is almost as great as when they are run independently, the only important difference being in the weight of the skip.

THE desilverization of base bullion is generally accomplished by what is known as the Parkes' process, which depends for its success upon the fact that when 1% or 2% of zinc is added to molten base bullion the zinc forms an alloy with the silver, which having a lower melting point than lead, crystallizes, and, being lighter, floats on the surface of the metal and is skimmed off, the lead being then refined separately. Another method of desilverizing lead is by what is known as the Pattison process, based on the fact that when silver-bearing lead is allowed to cool nearly to the point of fusion, crystals of lead will separate which are comparatively poor in silver. These are removed and additional bullion added and the process repeated, which results finally in the production of a large amount of lead low in silver and a much smaller amount of lead rich in silver. By continued repetition of the process, a marketable lead is produced, and the various impurities usually present form a scum or dross at the surface of the bath and are skimmed off, thus purifying the lead.

IT is not good business nor good mining to put in a large and expensive hoisting plant to sink a shaft to 2000 feet. Hoisting engines are made which will do this readily and which cost but a few thousand dollars. By installing a plant of this character, the expense of plant and cost of running it are greatly lessened. If a larger plant is necessary, when the shaft is down that depth, it will be time to install one. It will ordinarily require from 400 days to three years to sink 2000 feet, depending on conditions, and the wear and tear on a large engine during this period would be much greater and more expensive than on a small one. Running two skips of 1-ton capacity each, each engine of the pair would have to make 12,500 trips in sinking 2000 feet to handle the rock alone, beside men, timbers, water and other incidental trips, so that it is safe to say that under ordinary conditions the engines must make upwards of 20,000 round trips each in sinking 2000 feet, and this is a heavy tax on a large engine—much heavier, comparatively, than on a small one, when the amount of work accomplished is considered.



## Gold Dredging in Oroville District, Cal.\*

NUMBER III—CONCLUDED.

Written by L. J. HOHL.

Another set of figures follows covering the operations of dredgers over a period of three years, and it is but fair to state that the high percentage shown under the head of power troubles is not attributable to the present company operating in the field, but to an older electric power plant.

## CAUSES OF STOPPAGES IN PER CENT.

Moving ahead .....	5.7%
Power troubles .....	15.6%
Repairs and holidays .....	75.4%
Sand pump .....	3.8%
Total .....	100.0%

The average running time for the period given was 16 hours, 56 minutes. From other records extending over long periods of time it is probable that the best average running time of the boats will hardly exceed 18 hours out of 24, taking all causes of stoppages into consideration and figuring on 365 days per year. It is true that in a very few cases better running time has been obtained, but where this has been the case it was due to conditions surrounding that case, which it is not safe to figure on in every instance.

While the figures so far presented were for Bucyrus boats, I have condensed from Mr. Monroe's paper in the MINING AND SCIENTIFIC PRESS of February 6, 1904, corresponding data for a 5-cubic-foot Risdou boat, which I give below:

## CAUSES OF STOPPAGES.

Bucket line and ladder .....	30.7%
Clean ups .....	7.7%
General repairs .....	17.9%
Lines .....	9.9%
Power troubles .....	7.9%
Pumps .....	5.4%
Screens .....	4.5%
Stacker .....	9.4%
Total .....	100.0%

The data above extend over a period of one year, but not a picked one, it being a regular calendar year. The bucket line on the boat was renewed during the year, which makes the percentage of time lost on account of the bucket line and ladder high. Comparing the percentage of time lost on account of shaking screens and stacker with the percentage given for the picked year of the Bucyrus boat, we find, curiously enough, that the loss due to the shaking device in either case was exactly the same, while the Risdou stacker shows 9.4% as against 5.9% for the belt conveyor. The running time of the Risdou

As to the capacity of the different types and styles of boats, no fixed rule can be laid down, for the reason that the same dredger in different ground may not be able to make as much of a yardage, owing to local conditions. To mention one of these conditions, I would say that the washing of very sandy soil is more difficult than that of pure gravel, and it may be necessary to cut down the digging, for the reason

that the above figures come pretty close to the capacity.

The cost of production depends to a great extent on the magnitude of the enterprise, which reduces the general expenses, by dividing them up among a number of different boats and by the chance of keeping the repair cost down by the erection of repair shops at suitable locations. It has to be kept in



Dredging in the Boise Basin, Idaho.

that with full buckets the riffles become crowded.

A fair average of yardage would be about as follows: Three-cubic-foot Risdou boat, 25,000 to 35,000 per month; 5-cubic-foot Risdou boat, 35,000 to 45,000 per month; 3-cubic-foot Bucyrus boat, 35,000 to 45,000 per month; 5-cubic-foot Bucyrus boat, 50,000 to 65,000 per month.

mind that the operating expenses are further influenced by local conditions, such as nature of the ground, general efficiency of digging and washing appliances, adjustment of motors and resistances to their work, extraordinary repairs occurring in short periods of time and a number of other details.

The following statement will give a fair representa-



A Modern California Gold Dredger.

dredger for the year amounts to 16 hours, 39 minutes out of 24 hours. The cost of repairs to the conveyor during the year for the Risdou boat amounted to \$1241.28, an amount which about equals the cost of the belt conveyor in this particular instance, if the difference in lost time is taken into consideration.

The above figures would represent the work of a boat, as now in use in the Oroville district, extending over a long period of time.

The maximum obtainable will far exceed the figures shown and may be kept up for a short period with any one of the boats, but for periods of a year and over it will be found from the records of companies who take care to measure their ground accurately

tion of the extremes of the cost per cubic yard of material:

OPERATING EXPENSES IN CENTS PER CUBIC YARD.					
Power .....	1.06	1.20	1.15	1.61	1.77
Repairs .....	2.86	3.03	3.46	2.97	3.80
Labor .....	1.64	1.82	1.85	2.33	2.05
General expenses .....	0.64	0.67	1.23	1.28	0.73
Total .....	6.20	6.72	7.69	8.19	8.35

\* Abstract Trans. Cal. Min. Assn.



The data for the above statement were obtained from different operators in the district; the period over which they extend is in each case not less than one year and in one case more. In some of the figures given the taxes are included under the heading of general expenses, in others they are not. The cost of superintendence in some instances is included under the item of dredger labor, in others it is charged to general expense, but in all cases the totals give all the expenses incident to the working of the dredger and keeping it in good running order.

The life of a boat has not been determined as yet, but with a well and strongly constructed hull which is taken good care of, it should not be less than 12 to 15 years in this climate. It is self-evident that during that period a great portion of the machinery and appliances will have to be renewed over and over again, such as tumblers, ladder rollers, buckets, shaking screens, pulleys and shafts, spuds, conveyors, etc., but the item of dredger repairs, as shown in the above statements of cost of operating, will cover these items and there is no doubt but what the expense

- Sixth—Proximity of water.
- Seventh—Good long working season.
- Eighth—Proper contour of ground.
- Ninth—Accessibility.
- Tenth—Reasonable first cost of land.

The first of these conditions is, of course, influenced by all the rest of them, but practically all these conditions were met with at one time in the Oroville district; at present, however, land with all the earmarks of excellence is not easy to find, and the limit of dredgeable area in the district is being rapidly reached. Other fields, however, will no doubt be found, and with the knowledge acquired in and near Oroville, dredging, while still in the experimental stage, is bound to become a science and take rank with older methods of mining that have been developed to a high grade of perfection.

Gold dredging is even now entering through the portals of discussion and comparison of ideas and experiences, the fields of fixed forms and enlightened knowledge, and if this effort of mine has done a little towards the opening of the portals my object shall

munity from this form of mine accident is accredited to these warnings. In this country no official colliery warnings are given, and even the statistics are lacking to indicate whether there is any relation between the barometer and explosions in America. It is a field in which some profitable work might be done by the government at slight expense.

### The Coal Industry in Colorado.\*

[FROM A STAFF CORRESPONDENT.]

The coal industry is carried on extensively in several counties in Colorado. Among the large producers are Las Animas and Huerfano counties, in the southern part of the State. The coal field in the two counties mentioned is what is known as the southern field, and is believed to be an extension of the Raton district, extending to the south as far as Raton, N. M., and to the north through Las Animas county into Huerfano county to Walsenburg.

Las Animas county produces more coal than any other county in the State of Colorado. The output in this county is controlled largely by the Colorado Fuel & Iron Co., Victor Fuel Co. and a number of smaller companies. The Colorado Fuel & Iron Co. is operating at Tercio, the terminus of the Colorado & Wyoming Railway, running out of Trinidad, Colo., and which is controlled by the C. F. & I. Co., and also along the line of this road at Sopris, Segundo and Primero.

At Segundo, 16 miles from Trinidad, this company has 800 coking ovens. The product from the mines at Prunero, 3 miles distant, is washed and made into coke at this plant. A large percentage of the coal near Trinidad is good coking coal.

At Sopris, the Valley Fuel Co. has recently started operations. This property lies about 6 miles west from Trinidad. The company has a shaft down 75 feet. The head frame is 84 feet from the surface to the wheel. The coal is hoisted to the surface in cars which hold 3500 pounds. These cars are hoisted on self-dumping cages. When the cage reaches a certain point the coal is dumped into a sheet-steel hopper.

The hopper is attached to a pair of Fairbanks automatic scales, where each car of coal is weighed, and from this hopper it passes onto a shaking screen. It passes over 4-inch and 1-inch screens, and from there goes to the loading bins or cars.

The mine has a daily capacity of 260 tons. The vein is 5½ feet thick and opened up about 600 feet from the shaft. The fan supplying air to the mine is placed over another shaft, which is approximately 260 feet from the boiler room. This fan is 16 feet in diameter by 5 feet 2 inches wide. It is used to draw the foul air from the mine or force good air into the mine. It is capable of supplying 75,000 cubic feet of air at sixty revolutions per minute. A small engine, located near the fan, furnishes the power for operating it. This mine is also on the line of the Colorado & Southern Railway and the Colorado & Wyoming Railway.

Mine No. 21, at Starkville, on the main line of the Santa Fe Railroad, is operated by the C. F. & I. Co. The drift on this mine is approximately 4½ miles. The coal is brought to the mouth of the drift by motors and from there hauled by small engines to the tippie, where it is put through the washer and sent to the ovens to be made into coke. Three fans supply air to this mine. The first one is 7x20 feet, and the force fan is 7x12 feet. The intermediate fan inside of the mine is 7 feet. This fan has recently been installed and is known as the Sine. The fans are operated by electricity. At this plant they have 200 coke ovens in operation. The mine produces about 32,000 tons per month. The washery has a capacity of 600 tons per day. The machinery used in the washery is complicated, but works in somewhat the same manner as jigs. The coal passes through the jigs and is carried out with the water and through a revolving screen. As it leaves the trommel it goes into a disintegrator and from the disintegrator to an elevator, where it is carried to the "larry" bin and from there is conveyed to the coke ovens. The coal is handled in such a manner that it is thoroughly dried before reaching the ovens. The ovens are circular in form and lined with firebrick. The retaining walls are made of stone.

An oven is allowed to burn about forty-eight hours. At the expiration of this time the coke is wet down by means of a hose with sprinkler attached. It requires 500 to 600 gallons of water to cool an oven and takes fifteen to twenty minutes to water an oven. The doors are lined with one thickness of brick and luted on with mud and ashes. As soon as the oven is empty it is recharged with about five tons of coal. The ovens are still hot when refilled, and as soon as the door is plastered up they recuperate themselves.

At Grey Creek the Victor Fuel Co. is operating. The product is brought from the mines to the main line of the railroads over their own track, a distance of 10 miles.

The accompanying illustration shows the washer, power house and boiler room of the Victor Fuel Co. at Hastings, Colo.

The slope on this property is 4000 feet deep. The

\*See illustration front page.



The Bucket Line of a Modern Dredger.

rience gained so far, and which will be gained in the future, will have a tendency to gradually diminish such expenses, and what is even more important, forestall the occurrence of larger mishaps.

The prospecting for gold in our district is universally accomplished by means of Keystone drillers. This machine drills a hole of about 7½ inches diameter, the casing for the hole is driven ahead of the drill as far as possible and the drill is supposed to cut out the core, the contents of which are determined by the diameter of the casing, and these contents are brought up by the sand pump, rocked and panned by the usual methods, and from the results the value per cubic yard of the particular hole is determined.

There are no very reliable data on a large enough scale to determine the relative value of the ground as obtained by drill prospects and afterwards developed by the dredger. It seems to be conceded that the percentage to which the dredger will work, provided the drill holes are numerous enough, vary between 70% and 90%. The principal features of a good gold dredging property are:

- First—Paying values in the ground.
- Second—Good bedrock, which can be cut into and scraped up by the digging buckets.
- Third—Depth not exceeding, say, 60 feet below the water line.
- Fourth—Easy digging ground.
- Fifth—Good facilities for power.

have been accomplished.

In conclusion, I want to thank my brother mud-diggers in the Oroville district for valuable information received from them and assistance rendered.

### The Barometer and Coal Mine Explosions.

The comparative infrequency of explosions in English coal mines as compared with those in American mines is noted by the Record Herald of Chicago, Ill., which says 600 lives were lost last year, and insists that one reason that reduces the number in England is the reliance that mine engineers place on the "colliery warnings," with reference to atmospheric pressure, which warnings they have been furnished for the past twenty-four years. These warnings have been based on the theory that explosions are more apt to occur at the time of a sudden fall in the barometer. A fall of 1 inch in the barometer is equal to a reduction of air pressure to the extent of about half a pound to the square inch. With this lessened pressure the gases from the coal issue into the workings of the mine and the danger of explosions becomes suddenly increased, so that extra attention is given to ventilation as a preventive. Warnings are given when the barometer is high and apt to fall suddenly in order that the danger may not be overlooked, and the comparative im-



coal is first hoisted 3000 feet by means of a steam engine and the other 1000 feet with an electric hoist. The coal is then trammed with an endless rope from the mouth of the slope to the tippie, a distance of 300 feet.

The slack is used for coking purposes. The lump coal is not put through the washer, but is shipped for commercial purposes. The production is from 1500 to 1600 tons per day. They have 189 coke ovens. The coal for the ovens is washed through six jigs. Here ninety-five ovens are pulled each day. The plant is equipped with machine shop, hoisting engine, generators and boilers. D. E. Davis is superintendent. This company is also operating at Delongha, a few miles above Hastings, where they have eighty ovens in operation and making preparations to add eighty new ovens. The ovens are recharged at these plants by an electric "larry" car. Each one of these cars will hold five tons of coal. The camps are connected with the main line of the railroad by their own track, which consists of about 12 miles.

The Northern Coal & Coke Co. has considerable property at Aguilar, but has not been operating to any extent since the fire several months ago, which destroyed their mine buildings.

## The Strength and Life of Mine Timbers.\*

NUMBER III.—CONCLUDED.

Written by W. H. STORMS.

E. Hampton, superintendent of the Oneida mine, Amador county, Cal., and who has had much experience elsewhere, has kindly contributed the following:

"The timbers used at the Oneida are yellow, bull and sugar pine, spruce, fir and cedar (native timbers, 50% of which is bull pine) and also some Oregon pine. There are only a few places in the mine that timber of any kind or dimensions has a chance for a natural life—that is, to stand long enough to slowly decay, the ground being very heavy, as nothing is left to tell the tale, but where conditions exist to determine the life of a timber I find that bull pine timbers, 20 inches in diameter, put in place in a well ventilated, dry drift four years ago, are now rotten clear through, without any perceptible fungous growth; that timbers will decay in the Oneida as readily in still air as in a current of air; that fungus will take hold of green as well as dry timbers; that green timbers will better resist fungous growth, and last longer, than dry timbers; that moisture in plenty, where pressure does not exist, continues the life of tim-

ber indefinitely, regardless of ventilation, especially spruce. We cleaned out an old drift in 1903 that was run in the '70s, and timbered with spruce, and found those that were not broken as solid as when first cut.

"For all around mining purposes I consider best: First, spruce; second, yellow pine; third, bull pine, and, in order, sugar pine, fir and cedar. In heavy ground there is but little use for the last three, but I believe cedar will resist decay longer than any other timber. Redwood I know nothing about.

"In February of 1896 the Oneida shaft was started and timbered with 12x12-inch Oregon pine. In July of this year (1904) it had to be retimbered from the collar to 50 feet below. Timbers were all rotten. Change of season and change of atmosphere must be the cause, as gases from the mine never get to the timber, the draft being a down cast. Seventy-five feet below the collar of the shaft, where moisture is a fixed quantity, there is no sign of decay. Oregon timber is a good all around timber, but not equal to California spruce. With pressure it splits too easily. Perhaps if the dealers in Oregon would send to the mines the same quality as they send to the University for testing purposes we might change our opinion."

Frank F. Weber, assistant superintendent of the New Almaden quicksilver mines, Santa Clara county, Cal., has kindly volunteered some valuable information from that section:

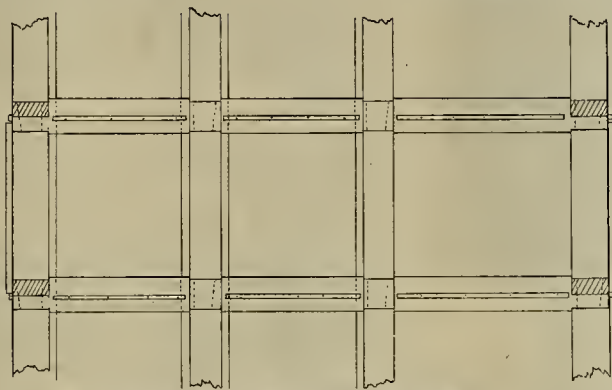
"During the last few years the timber used in our main stopes and gangways has been Oregon pine, although in the early history of the mine redwood timbers, either hewn or sawed, were universally employed, and the old workings remaining accessible offer good opportunities for observing the efficiency of this class of timber under various conditions.

"At the time of going into the mine the Oregon timber has been cut probably not longer than three or four months, so that, while it can hardly be classed as well seasoned, it is not as green as that used in some localities where timber, abundant in the vicinity, is cut, framed and ready for use almost immediately.

"Generally speaking, I believe that the condition most unfavorable to the life of any mine timber is one combining warmth with an abundance of moisture. In stopes where this condition is met with the effect on pine as observed here is rapid decay, the timber being attacked by fungus, occasionally, as early as from four to six months. Redwood under the same conditions does not seem to be attacked so readily by the fungus, and its life is considerably longer.

"In making a comparison of the relative enduring qualities of redwood and pine under favorable conditions—in an unusually cold and damp tunnel—the following facts were observed: Ten by ten-inch redwood timbers put in place over thirty-five years ago, while being sound at the center of the stick, showed a decided softening near the surface, although they are still serving their purpose satisfactorily.

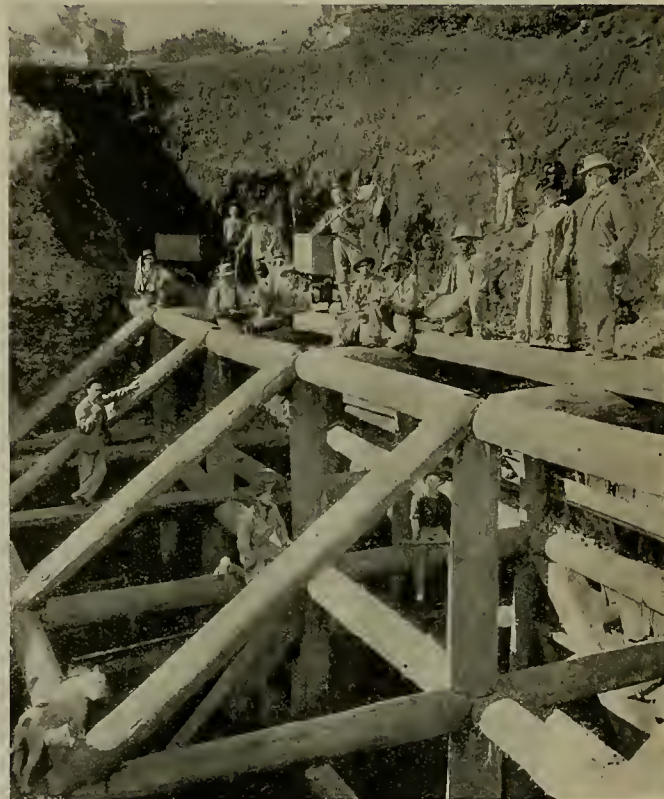
"In the stopes requiring considerable timber to support the ground Oregon pine (Douglas spruce) has been employed, and is found to be the most satisfactory in every way. Especially is this true where the square set system is employed, for in taking



Framing of Shaft Set Viewed from the Side.



Placing a Cap on a Drift Set, Hayden Hill Mine, Cal.



Square Sets with Round Timbers, New Almaden Mine, Cal.

At Walsenburg the C. F. & I. Co. is operating the Walsen and Robinson mines. Considerable work is being done at Pictou, Sunnyside, Toltec and other points near Walsenburg.

## Electrolysis of Platinum.

Platinum is generally considered to be an ideal electrode for electrolytic processes in which the electrodes play no part, says the Electrical Review. It is a good conductor, it does not oxidize, and is generally thought to be unaffected by electrolysis. This is true so long as the current flowing from the electrode does not vary, but, if it vary, electrolysis may take place, although ordinarily there would be no reaction between the conducting solution and the metal. This phenomenon has been investigated recently by Messrs. A. Brochet and J. Tiet, the electrolyte in this case being sulphuric acid. The action took place whether an alternating current or a varying direct current was used. No explanation of this peculiar action is offered. It has been known for some time that metals could be dissolved electrolytically by means of an alternating current, the explanation offered being that, while the greater part of the metal dissolved during one-half of the wave was redeposited during the next half wave, some managed to get out of the reach of the electrode, as it were, and remained in solution; but the action of platinum is not similar to this, for platinum itself is not dissolved by a direct current, but dissolves only when the current varies.

weight this class of timber will stand a surprising amount of buckling and twisting before absolute failure. Redwood, on the other hand, will not support weight nearly as well. It is brittle, and will split and give way without warning—sometimes so quickly that timely repairs are often prevented—while pine shows at which place repairs are needed, and allows ample time in which to do such work.

"With regard to the effect of carbon dioxide gas on timber, I do not believe that it has any noticeable effect one way or the other. It is met with in considerable quantities in portions of this mine, and any particular effect would be noticed. On the other hand, foul gases arising from a pile of decaying timber will, in all probability, cause a favorable condition for like decay in adjacent timbers.

"It would be a hard matter to give an accurate estimate as to how long a stick of timber, such as you mention, would endure even under favorable conditions. However, I should judge that seasoned redwood, in a wet shaft or drift, such as the one heretofore mentioned, and coming in contact with a current of fresh air, should last for all practical purposes from thirty to forty years; Oregon pine, under like conditions, for from fifteen to twenty-five years.

"In my opinion, the best timber for all around mining work is well seasoned pine of the better varieties found throughout the Northwest. As a rule, it is a strong, safe timber to work with, and its life is sufficiently long for all practical purposes. Wherever possible, the class of timber employed should be that

\*Abstract Trans. Cal. Min. Assn.



which best suits the conditions met with, and an ideal state of affairs would be to use redwood in all shafts and main gangways, and timber the stopes and drifts of lesser importance with pine. The price of redwood, which in this locality is nearly twice that of pine, often prohibits its use."

From the notes of Mr. Weber it will be noticed that comparison is made only with Oregon pine (Douglas spruce) and redwood. It is a fact that large amounts of carbon dioxide issue from crevices in the rocks in some of the workings of the New Almaden mines, and it is known that some carbon dioxide also results from the decay of timber, and that it is found to a greater or less extent in all mines, but the fact that where this gas accumulates in excess, as at New Almaden, without having a noticeably bad effect on the timbers in the mine, suggests that there is some marked difference in these gases (the carbon dioxide issuing from fissures in the rocks and that emanating from decaying timber) not yet understood. Probably the latter consists largely of hydrocarbons.

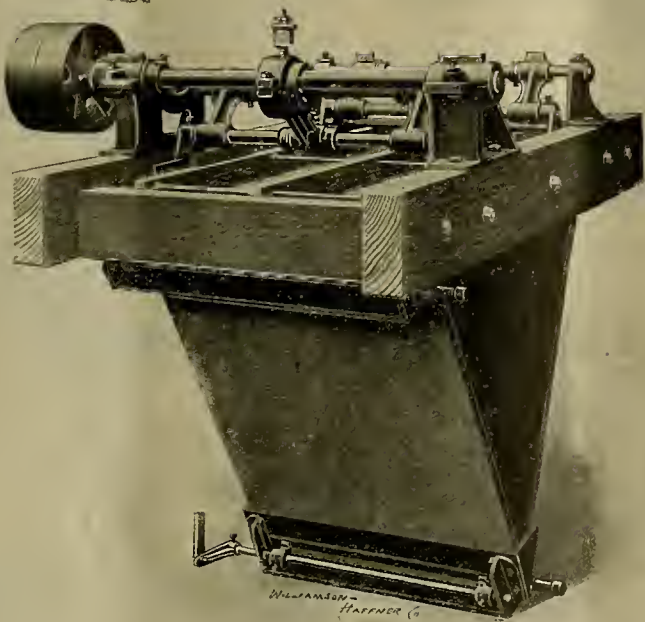
There are various methods in use for preserving timbers for structural purposes, but these preparations mostly contain hydrocarbon compounds, and are not generally considered suitable for mine use underground.

In most cases the life of mine timber is determined by the amount of pressure it must sustain, and in many cases timbers are bent and crushed and split long before they have suffered great decay.

I regret that there is not more reliable data available upon this important subject, but hope that these few notes may result in a discussion which will give us more and much needed information on this practical and interesting matter.

### New Shaking Screen.

Herewith is illustrated the Wild shaking screen, which receives its motion from an eccentric placed



Wild's Shaking Screen.

on the drive shaft of the machine to impart a motion similar to that given to a screen or sieve in hand work—a thrust downward and forward at the same instant, the downward thrust to force the finished product through the screen, the forward movement to assist the oversize off the end into its receiving spout. The frame of the screen is made of bolted timbers; inside is the screen pan, supported by four hangers placed on the frame; the screen itself is tacked or screwed to a frame and held in place by wedges. New screens may be so placed. The thrust of the machine may be varied from a 1-inch throw to as small as desired, different points showing the throw being arranged on the eccentric.

The illustration shows the single wet screen with steel hopper. The screen for dry ores is furnished with dust-proof guard above screen and without lower hopper. The screen is also made double and triple, for both dry and wet work, screens being placed one above the other and all receiving the motion from the same eccentric.

The screen area is 9 square feet and the revolutions 325 per minute, giving 2925 square feet of contact per minute. A revolving trommel of the usual type and operating at the usual revolutions per minute, 36 inches diameter by 6 feet long, gives 1080 square feet of contact and requires 54 square feet of cloth.

The machine is asserted by the makers to have been in actual use for six months in various mills, and the stated results would seem to justify the manufacturers' claims of maintenance, capacity and durability. The capacity of the machine is stated by the manu-

facturers to be from fifty to seventy-five tons, according to the fineness of the mesh.

W. E. Wild is the inventor of the screen and it is manufactured and sold by The S. H. Supply Co. of Denver, Colo. Catalogues will be sent on request.

### The Central Eureka Mine, Amador County, Cal.\*

The deepest, and some of the most important, mines in California are in Amador county between Plymouth on the north and Jackson on the south. One of the latest mines to be developed in this section is the Central Eureka, the annual report of which was published herein in the issue of April 22. The mine was originally known as the Summit, and was successfully worked in the early history of mining on the Mother Lode. An ore shoot was discovered and worked at the north end of the property at that time through an old shaft. In 1895 the mine was reopened by the Central Eureka M. Co., under the direction of W. R. Thomas, who is still superintendent. Several shafts had already been sunk on the vein, the deepest being the most southerly one, which was down 700 feet when the new company commenced operations. This shaft was continued on the vein to a depth of 1000 feet, but until that depth was reached little ore of value was encountered. A drift on the 1000-foot level, however, cut three short and narrow shoots of pay rock. The shaft was continued downward and as level after level was opened at greater depth the three short shoots on the 1000-foot level were found to lengthen and get thicker, until the ends overlapped and formed practically a continuous shoot of ore over 600 feet long and, in places, 25 feet in thickness. At present the shaft is down 2300 feet with sinking in progress to the 2400-foot level. A connection was made with the South Eureka workings, adjoining on the south, at about the 1600-foot gear; it is then trammed to a 40-stamp mill which

day. There are twenty concentrators, and the concentrates are treated at the local chlorination works at Sutter Creek.

They use oil fuel for the boilers for the hoist, and electrical power for the mill and air compressor. The photographs and much of the accompanying information is furnished through the courtesy of Mr. P. L. Young of San Francisco, Cal.

This property has distributed forty-six dividends. During the past twelve months it has paid out \$320,000—or 80 cents per share in dividends.

### Mining Costs in British Columbia.

The annual report of the War Eagle Con. mine at Rossland, B. C., contains many items of interest to miners, as the manager has given to the stockholders of the company, and incidentally the public, the benefit of the itemized cost of mining at that property. The ore is chiefly iron and copper sulphide, with gold and silver values. The formation is greenstone schist, cut by intrusive dikes, and faults are numerous, which facts render development more expensive than in mines where the conditions are more regular.

The report contains a generalized statement for several years from 1897 to the close of 1904, but that for the year 1904 is of greatest interest, and is as follows:

DEVELOPMENT WORK.			
—January 1 to December 31—			
Work Done, Feet or Tons.	Total Cost.	Cost Per Ton.	
General work, stations, retimbering, etc.; machinery and equipment, re- pairs, maintenance, etc.	\$2,444 65		
Sinking main shaft.	6,344 33	\$36 15	
Sinking small shafts or winzes.	175 5	2,976 74	28 08
Raising.	105 0	34,442 69	17 77
Drifting.	1,938 0		
Total development work.	2,219 5	\$46,208 41	
ORE PRODUCTION.			
Ore from development work sold, tons	3,000		
Ore from dumps, storage, etc., sold, tons.	4,971	\$2,318 69	\$0 47
Stoped ore to mill.	4,304	10,381 03	2 41
Stoped ore sold.	48,780	123,879 60	2 54
Total ore sold.	61,064	\$136,579 32	\$3 24
SUMMARY.			
Expense of development per ton of ore sold.	61,064	\$46,208 41	\$0 76
Expense of production per ton of ore sold.	61,064	136,579 32	2 24
Total expenditure (per ton of ore sold).	61,064	\$182,787 73	\$3 00

TABLE OF COSTS, WAR EAGLE MINE, TWELVE MONTHS ENDING DEC. 31, 1904.

DEVELOPMENT WORK.				
	Sinking Main Shaft	Raising	Drifting	Ore Ex- traction.
Total advance, feet	175 5	105	1938	53,048
Ore stoped, tons.				
		Cost Per Foot	Cost Per Ton.	
Drilling.	\$ 7 45	\$ 7 17	\$ 4 23	\$0 46
Blasting.	1 87	2 13	98	05
Explosives.	3 52	2 93	2 54	10
General mine supplies.	67	43	36	02
Mine lighting, candles.	25	21	15	02
Mine lighting, electric.	23	18	16	02
Smithing.	65	33	41	04
Tramming and shoveling, direct.	3 15	1 87	1 56	38
Tramming and shoveling, apportion'd	96	75	55	12
Timbering, labor.	1 51	2 35		29
Timbering, material.	60	81		12
Machine drill fittings and repairs.	1 16	92	75	08
General mine labor.	1 06	1 35	1 03	13
Hoisting, underground.	4 79		34	01
Hoisting, main shaft.	1 68	2 16	1 17	24
Compressed air.	1 42	1 32	1 02	11
Mine ventilation.	29	21	18	02
Assaying.	48	52	14	05
Surveying.	39	12	18	02
General expense.	3 32	2 29	1 90	27
	\$36 15	\$28 08	\$17 77	\$2 52

WHAT is claimed to be the record for windlass hoisting in the Klondike, and probably in the world, says the British Columbia Mining Record, was recently made in Gavin gulch, near Grand Forks. In the presence of fifteen other miners, who appointed judges and a timekeeper, Charles Cook, a man weighing about 140 pounds, is stated to have made good his boast that he could raise from a shaft on Gavin gulch fifty buckets in an hour, which work ordinarily takes from three hours and a half to half a day. In an hour, less fifteen seconds, Cook had hoisted fifty-five buckets of dirt, dragged the buckets to the edge of the dump, emptied them and returned them to the bottom of the shaft. Unfortunately, neither the depth of the shaft nor the size of the bucket used was given in the account published in one of the Dawson papers, but the test of strength and endurance was stated to have been thoroughly genuine and well authenticated.

It is not always the deepest mine with the great surface plant which is the most satisfactory to the owners. Some small properties, with comparatively small invested capital, have been highly remunerative to the discoverers or operators.

CONCRETE is growing in favor in construction and engineering work, and it has a very extended usefulness about mines in the building of foundations, walls, reservoirs, dams, and in many other ways.

\*See illustrations on front page.



# Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 18, 1905.

Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ROCK DRILL.—No. 787,376; J. M. Hamor, Philadelphia, Pa.



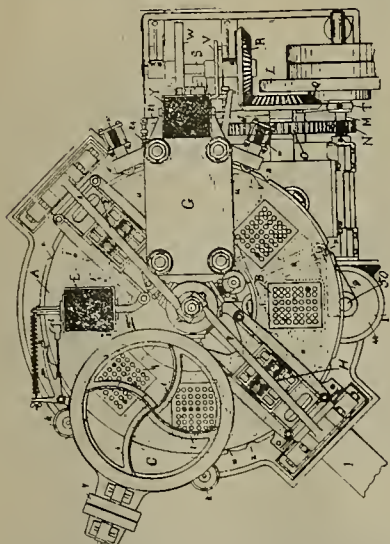
Combination, with cylinder, piston chamber and piston therein, and rotary valve and casing, of passage in valve casing adapted to be placed in constant communication with exhaust, channels in opposite sides of valve casing adapted to be placed in constant communication with supply, three channels in valve adapted in either position of valve to communicate with three channels in valve casing, respectively, and passages leading from ends of piston chamber to valve chamber, valve, in its two movements, causing exhaust channel in valve to connect with one or other of passages and causing one or other of supply channels in valve to connect with corresponding passage.

TUYERE.—No. 787,666; R. M. Downie, Beaver Falls, Pa.



Tuyere having air inlet, air outlet and open water outlet, means for introducing steam into tuyere and entraining air thereby through inlet, and means located in tuyere and path of movement of steam for condensing and collecting moisture thereof and directing same to outlet.

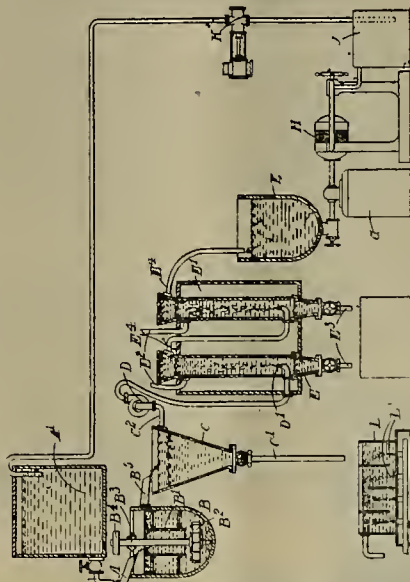
BRIQUET MACHINE.—No. 787,387; F. W. Meeker, Rye, N. Y.



Briquet machine comprising annular table supported vertically and laterally upon rollers mounted in eccentric bearings to allow vertical and radial adjustment of table, radial guide grooves in table, series of molds held within table, driving shaft, vertical shaft, intermediate gearing to transmit rotary motion from driving shaft to vertical shaft, horizontal

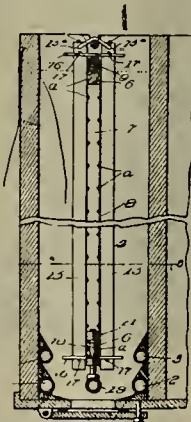
crank fastened to vertical shaft, crank pin at farther end of horizontal crank and sliding block mounted to turn on crank pin and engaging guide groove in annular table, whereby molds are successively presented to various operations; filling device; initial compression press; annular segmental plate beneath annular table; final compression press; dies fixed upon upper stationary head of final compression press; dies fixed upon platen of final compression press facing former dies and arranged to move with platen toward stationary dies during period of rest of annular table, and punching-out press for removing compressed material from mold.

SEPARATION OF METALS FROM THEIR ORES.—No. 787,814; J. D. Wolf, London, England.



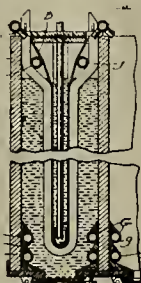
Process of separating metals from ores, which consists in agitating pulps with oil until oil has taken up all metallic mineral contents with some gangue, separating mineral-bearing oils from pulps, removing suspended particles of gangue from oil by passing it through warm water and separating metallic minerals from oil.

FILTERING CELL FOR SEPARATING SLIMES IN ORE TREATMENT.—No. 787,736; G. A. Duncan, Deadwood, S. D.



In filtering cell, in combination with filtering bag closed upon all sides, frame within bag for extending same, comprising plurality of vertical spacing bars at relatively short intervals in length of bag; exterior check bars arranged in pairs, two of each pair being separate and locked opposite each other at opposite sides of bag, and slotted plates which receive corresponding ends of two bars of each pair for connecting them together at both ends for binding check bars against upper and lower side bars of frame.

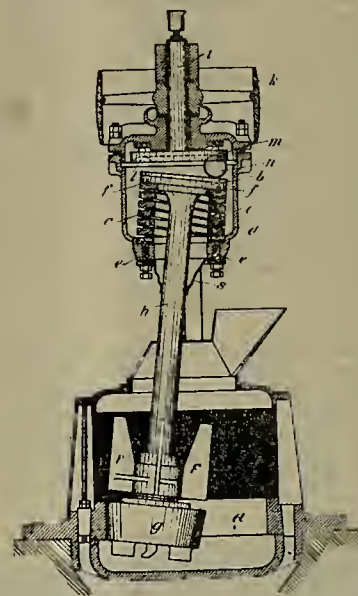
PROCESS OF TREATING SLIMES IN ORE REDUCTION.—No. 787,878; G. A. Duncan, Deadwood, S. D.



Process of treating ore slimes which consists in accumulating slimes upon exterior of filtering cell im-

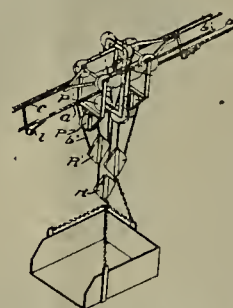
mersed in slime-bearing liquid, by suction from within cell and exhausting liquor from about such accumulated slimes, surrounding cell having slimes thus accumulated thereon with fresh metal solvent liquor, and drawing such liquor by suction within cell through slimes so accumulated on exterior, and subsequently detaching residual slimes from cell.

DRIVING DEVICE FOR PENDULUM MILLS.—No. 787,737; J. Durnholz, Kalk, Germany.



In driving device for pendulum mills, in combination, grinding pendulum *g h* resting on springs *c* by means of disk *b* in center over grinding surface and of single rolling body *n* inserted between disk *b* and another disk *m*, near periphery, disk *m* being rotated from outside and pendulum, being by springs pressed against rolling body, is moved thereby out of its perpendicular central position into inclined position with regard to grinding surface, which position is, in consequence of rotation of disk *m* and rolling around in circle of rolling body constantly changed.

AERIAL CABLEWAY.—No. 787,569; F. R. Freuch, San Francisco, Cal.



Hoisting and conveying apparatus, combination of hoist, trackway, carriage movable thereon, fall rope in two sections or units supported on carriage and at one end of trackway and extending to hoist, fall rope carriers and supporting means therefor, traction ropes, fall rope sections each supporting equal portion of load and means for operating fall rope sections and traction ropes correlatively.

PROCESS OF ROASTING ORES.—No. 787,540; S. B. Patterson, Phillipsburg, N. J.



Process for continuously roasting body of ore, intermittently feeding charges to top of body, intermittently subjecting body throughout its length to action of hot air, in intervals repeatedly subjecting lower portions of body that have been subjected to hot air to action of steam, and withdrawing roasted ores from base of body.



## Charters Towers District, Queensland, Australia.

Written for the MINING AND SCIENTIFIC PRESS BY C. M. NAYLOR.

Charters Towers, the premier goldfield of the State of Queensland, also the present leading goldfield of the eastern States of Australia, was discovered in 1872 by three prospectors, and since then has been one of the most consistent gold-producing centers that has been found in Australia. As usual with the majority of mining fields in their early history, the ore near the surface was rich and many hardy and deserving prospectors had their efforts of a lifetime rewarded.

The first mine which sprung into existence was the North Australian, which was worked out several years ago, but from which, in the early days, handsome dividends were distributed to its shareholders. Other mines were soon discovered and the same richness of ore continued near the surface. Since then the field has gone ahead by leaps and bounds, until to-day it carries a steady population of about 23,000 people, of whom over 5000 are directly employed in one or the other branches of the mining industry.

The principal reefs which have been worked for a number of years and have paid substantial dividends are the Brilliant, Day Dawn, Victoria and Queen, and the principal mines and dividends paid by each on the separate lines of reef are as follows:

Brilliant line—Brilliant P. C., \$3,400,000; Brilliant and St. George United, \$3,650,000; Brilliant Central, \$825,000; Brilliant Block, \$360,000; Kelly's Queen Block, \$700,000; Phobe, \$600,000; Brilliant Extended, \$90,000.

On the Day Dawn line are the Day Dawn Block & Wyndham, \$4,050,000; Day Dawn P. C., \$1,300,000; Mills' Day Dawn United, \$1,462,500; Day Dawn Gold Mines, \$300,000.

On the Victoria reef are the Victoria P. C., Victoria & Queen and the Victoria & Caledonia Block, which have paid a total of nearly \$2,500,000.

On the Queen reef are the Queen Cross Reef Co. with \$1,200,000 and the Band of Hope, New Queen and the Papuan, Brilliant and Victoria, which have a total dividend list of over \$1,000,000.

Another promising line of reef paying occasional dividends is the Ruby, and with the present prospects will in a few years, when properly developed, pay very substantial amounts to its shareholders.

The output of the field at present is about 25,000 tons per month, to which the Day Dawn Block and Wyndham contribute about 3000 tons, Brilliant Central, 3000; Brilliant and St. George, 2500; Queen Cross, 2000; Brilliant Extended, 3000; Brilliant Block, 1500; Mills' Day Dawn United, 1000, and several others with smaller outputs.

It is to be regretted that the total return of bullion for the year 1904 fell considerably below that of the record year of 1903, which was chiefly due to a falling off in the returns of the two principal gold producers, viz., the Queen Cross Reef mine and the Brilliant Central. In the case of the first, the mine was not worked as it should have been for the benefit of the field during the years 1902 and 1903, also part of 1904. During the latter part of 1901 a very rich vein of ore was discovered in the footwall workings and during the whole of the two years 1902-3 this shoot was the only one worked on, and was worked out regardless of the neglect in prospecting work from which other parts of the mine suffered. For the two years this ore was worth from \$50 to \$60 per ton, but during 1904 its value began to drop slowly but surely, until at the close of 1904 the value per ton of ore mined was from \$20 to \$25. Needless to say, during these halcyon days the shareholders' pockets swelled very visibly, but during the past few months the dividends have decreased over 50%.

In the Brilliant Central the value of the ore has decreased considerably during the past year. This is due to the quality of the ore in the footwall workings becoming poorer, which some time ago was unusually rich, and which when mined with the poorer quality from the hanging wall vein enabled dividends to be paid regularly, with an occasional extra.

Without doubt the prospects of the field generally are not as good as two years previous, but it is always a noticeable fact that at other times when prospects have been exceedingly poor something sensational has been struck and caused a general revival, and the case to-day is probably no exception to this rule. Two very rich prospects have been discovered in the vicinity of the town, one about 13 miles out, where an outcrop was found to be very rich, the first 100 tons being worth about \$100 per ton.

Another find, still richer, was discovered about 30 miles from town and the first crushing of fifteen tons of which gave a return of about \$200 per ton. This is also from an outcrop.

In the vicinity of both of these finds numerous claims have been taken up and the whole country will now be subjected to a good prospecting. One of the old-time large producers, Mills' Day Dawn United, which has been under a cloud for the past eight years, is again coming to the front on a newly discovered

vein of ore in their eastern ground, and this will soon probably be on the dividend list again.

The methods of work are somewhat similar to other fields when working on the same kind of reef. They are all incline reefs, the dip of which varies from 20° to about 60°, and taking a general view of the field the hanging wall country is very bad, chiefly composed of rotten diorite. This requires careful timbering which is carried out in the stopes on the "pig sty" or crib principal, and all the open spaces are filled with mullock (waste). Special large timber is very scarce in the vicinity, consequently expensive. The majority of the shafts are started vertical, and when the lode is intersected a curve is put in for the use of skips or a chamber is cut for a winch, driven by compressed air, to haul the ore up the incline shaft and the trucks transferred to a cage in the vertical shaft. There still remain a few incline shafts sunk from the surface, but they are now looked upon with disfavor, as the vertical shaft is always better for prospecting purposes. Ventilation is the one important thing which seems to give the mine managers an infinite amount of trouble. What with the small shafts that have been sunk from the surface, and the small workings in a large number of the mines, an insufficient amount of air for the men is the result, consequently the heat in some of them is almost unbearable, and the men can neither work anywhere near the whole time, nor do what is required when they are working. One advantage, however, is that the whole of the mines are practically connected with one another, which makes a large number of them much cooler, while in other cases it makes them warmer.

Development work with the rock drills, however, is the worst. In the larger number of cases the temperature is very high, and men work only with a pair of trousers and boots, and their garments are constantly saturated from perspiration. What is needed to-day in Charters Towers mining district more than anything else is a scientific method of working. I have no desire to rob the mine managers of the field of their just due, for, without doubt, they are as good practically as can be found anywhere, but mining is like every other business, and on that field they lack in scientific methods and proper organization. Until recently the idea of having a scientific man as manager of a mine was viewed with contempt among the greater number of miners, but since the appointment of W. A. McLeod as general manager of the Brilliant Extended gold mine that idea has been modified. The success with which this manager has met in his style of working is an "eye-opener" to the field, and I think the day is not far distant when men of his experience will be in demand there, and the sooner that technical men are given charge of the mines the better it will be, because the future of Charters Towers most assuredly lies in the successful handling of low-grade ore.

The metallurgical treatment of the ore is in a far worse condition than the mining, and the scientific man is far more needed here also. All the ore has to be transported some distance from the mines to the mills, as the latter have to be built where a plentiful supply of water can be obtained.

The Day Dawn Block and Wyndham companies have their batteries on the banks of the river Bendekin, some 10 miles from town, and branch lines are laid from the main line to the ore bins at the mine, and to the bins at the battery.

The Queen Cross Reef Co. have also a tram line  $\frac{1}{2}$  mile long to their battery.

In all the other cases the ore is carried in drays or wagons drawn by horses, which generally costs about 20 cents to 25 cents per ton for cartage.

Most of the batteries are fitted with rock breakers and elevators, but there are still a few who adhere to the primitive method of hand feeding—breaking the lumps with a hammer and throwing the ore into the mortars with a shovel. Happily, the latter is dying a natural death, and not too soon. The principal method of crushing is by stamps, and lately heavy stamps have been installed at most of the batteries.

At the Enterprise mill there are five Huntington mills, but there does not appear to be much difference in the work between these and the same amount of power in stamps. In these modern days of up-to-date methods in ore reduction it is surprising to see types of concentrating machinery long since recognized as inefficient, but here, until recently, they were in full swing, and such a thing as a modern concentrator was seldom heard of. In fact, the Enterprise mill was the only one that had them installed twelve months or so ago. During the last twelve months these things have been gradually changing for the better. Modern machines are now recognized as standard in the place of Berdan pans and other such devices, which ought to be on the scrap heap.

Cyanide plants are attached to every battery in the town, and it is here that one can see the technically trained man as "boss of the situation." There they have to have him, and consequently they are worked with every degree of success, and the amount of bullion which is lost after these men have treated it is of very little consequence.

I have tried to explain how much Charters Towers is in need of properly educated men in this branch of industry, and on him this town will now depend. With him there is every chance. The field will last for some generations, for as the time advances so

does the scientific man in the work. The untrained man, especially in mining matters, is too easy to sit down and let improvements and science go gaily on their way, but when the rich ore has all gone and his position depends upon the treatment of poorer quality ore, he finds himself supplanted by one who has followed and kept pace with the times, and that is what will happen some day on Queensland's premier goldfield.

Another great thing that deters this field is the want of necessary capital. Unfortunately, Queensland itself has fallen into the idea, politically, that she does not want the capitalist or moneyed man. Could a greater mistake be imagined for a young country to make, especially when in mining capital is of the greatest necessity?

Charters Towers is not the only sufferer. The whole of north Queensland is the same, for it is safe to say that no richer district in mineral wealth is known on the face of the earth than this. Mineral fields abound everywhere, and anybody who has been in the country will and must acknowledge the richness of such places as Cloncurry, The Etheredge, Croydon, Palmerville and numerous others, whose only difficulty is not being in railway communication with the rest of the world, thus rendering it impossible to have the ore sent to the smelters on account of the excessive charges for transportation. But the Queensland government has not the money to build the railways, and at the same time will not grant concessions to private syndicates to build them. If only this great Australian State would throw itself open to private enterprise in railway matters, its mineral wealth would be found to be greater than the imagination of the people who live in that country; but until the railways do open up all these fields the mineral wealth will lie there, a buried treasure.

An idea can be formed of the richness of the Cloncurry district when in 1871 this district and Arizona were looked upon as the great rivals for the copper production of the world. Arizona has gone ahead solely through railway communication, and Cloncurry would have been in the same place if such a railway policy had been pursued as is pursued in the United States.

As indicating the possibilities of Queensland as a field for the prospector, notwithstanding the fact that mining has been carried on here for many years, it may be said that new strikes are not of infrequent occurrence. Not long since a woodchopper discovered a vein while at work near Charters Towers. He had a quantity of the ore crushed in a custom battery and it returned over \$70 per ton. The gold-bearing rock is a dike of considerable size and longitudinal extent. The entire district about this discovery has been staked solidly for miles. A part of this vein or lode is described as a seam of kaolin stained black with iron and manganese oxide. Other discoveries are being made, and the general belief is that a new and valuable gold field has been discovered. About 150 miles from Charters Towers, on a stream known as Lucky creek, another strike is reported made by old prospectors, who have found a small vein 1 to 3 feet wide that runs about \$300 per ton in the mill. A rush to this latter place has also been made and hundreds of claims taken. At Lucky creek the water level has already been found at about 70 feet below the surface. The gold in these veins is worth about \$18 per ounce. The finds in these two districts have greatly stimulated prospecting in the country about for many miles.

## Diamonds in the Transvaal.

The extensive opening of the Premier diamond mine in the Transvaal brings to mind the discovery of numerous diamonds at various points in that State in its early history. A diamond weighing 4½ karats was found about 2½ miles from Pretoria, the capital, on the Hennessy farm in 1871, and several good sized diamonds were found in the gravels along Elands river. Two diamonds of value were found at Zoutpansberg, and in 1870 a diamond worth \$750 was found at Rustenburg.

In 1897 D. Draper of the Geological Society of South Africa made public the discovery of a diamond bearing pipe near Pretoria. Concerning this, Page's Weekly contains the following:

In 1897 Mr. Draper notified the members of the Geological Society that an interesting discovery of a diamondiferous pipe had been made in the vicinity of Pretoria. He had the permission of the owners to make public the fact that diamonds had been found in what appeared to be a small volcanic pipe, containing minerals closely resembling those in older known diamond mines. Garnets "carbon," olivine and other minerals associated with the diamond were there in abundance and eleven diamonds, one weighing 16 karats, and several smaller ones had been found in washing the blue. The interesting feature regarding this find of diamonds was that it was the first undoubted diamond mine found in the Transvaal, and as it was situated in the quartzites of the Magaliesberg, it was in a geological horizon much older than the Karoo shales of Kimberley, and also than the cave stones wherein the monastery diamond mine was situated.



### A Simple Stope Record.

Written for the MINING AND SCIENTIFIC PRESS  
by MATT. W. ALDERSON.

The readers of the leading mining journals are frequently advised of the value of good maps of underground development. Where a mine is fortunate enough to have an educated engineer in charge, or is developed to such a stage as to afford such a luxury on the staff, or as an occasional visitor to check up the record of development and make a map of it, this article may be of little if any value. It is only in recent years, however, that persons who think of following mining as a business or profession have considered the importance of a technical education in connection with their life work. In most sections it will be found that a majority of the mine operators have received the greater part of their education in the school of practical experience. Invaluable as

wishes to detail his work on a good-sized scale. For most map work the cross-section paper ruled in millimeter squares is preferable. This paper has larger squares of 5 centimeters, each centimeter being subdivided into four blocks 25 millimeters square. By letting each square on the paper represent a foot, we have in one paper 10 feet to the inch, and in the other a little more than 25 feet to the inch. Most mining engineers plat on a smaller scale, often 40 feet or more to the inch. This can be done easily, of course, with this paper, by making each square represent 2 or more feet instead of 1, but the beginner will find it easier to put in details he may wish on the larger scale.

The advantage of using the cross-section paper is that by making the map on a scale of 1 millimeter to the foot one may read at a glance each 5, 10 or 50 feet on the map, thus doing away with the necessity of measuring and figuring out distances according to the scale that may have been used.

Mining engineers would map several veins or

hole to mark the elevation and to save having to re-survey below that point. A 5-foot stick, with notches showing plainly each foot, is a handy measuring instrument.

The ground stope may be shown on the map by tinting in the squares. If shown by cross-hatching, the map will not present a neat appearance after a number of additions have been made. The tinting of the sections may be done with waterproof drawing ink, or, as an expedient and in getting practice, one may use an ordinary colored lead pencil. Thus, with simple tools, easily procured, one may make a map which will show plainly what has been done in the mine and what ground is untouched. With a little practice one may make a very neat map and show on it such details as are of particular interest in his property. As a matter of course such a map as here suggested could not be depended upon for the accurate location of certain underground points in the event of it becoming necessary to make an expensive connection with some distant point, but for



The Lucky Tiger Mines, Sonora, Mexico.

this experience has been, it nevertheless has its limitations. At the same time it is these practical men who are quick to see the value of suggestions for saving time or enabling one to do his work to better advantage.

It is possible that many persons neglect making maps of their work because they are not familiar with a way in which it may be done, and imagine it to be quite a complicated affair. But oftentimes that which we think must require long training is exceedingly simple when once understood.

The advantage of a map is that one may ascertain the exact location of work without having to enter the mine for the purpose. In fact one cannot have a clear and comprehensive idea of what work has been done in the mine and what ground may be available for stoping without a map.

The writer has found a very simple way of keeping his mine maps by the use of cross-section or profile paper—that is, paper with lines crossing it vertically and horizontally—obtainable of any stationer dealing in supplies for engineers. There are two kinds of this paper especially adapted for this work. The first is ruled in squares of 1 inch, with ten crosslines to the inch each way. This is convenient where one

branches of the same vein on one sheet, tinting the separate ore bodies with different colors. But it will be well for the beginner to map each vein by itself. The stope map is made to represent the vein as if the hanging wall were removed and we were looking down upon it from that side.

Commence the map by laying out the levels. In doing this never take account of their grade, but run the lines as if the levels were really level. Take no account of inches; for a few inches one way or another does not make any material difference. Thus the level may be mapped as 6 or 7 feet, regardless of its being 6 feet 2 inches, or 6 feet 10 inches. Map according to nearest height. Next map in the shafts, chutes and manways. Then map in the raises.

In the mine, in securing the data of the stopes for use on the map, it will be convenient to carry a small memorandum book, ruled with cross-section paper. Let each cross-section represent a foot and each page a raise above an ore chute. In mapping raises partly made, one may cut a notch in the last cap, or mark the wall so he may know the point to which he has finished his survey. A good way to do this is to drill a hole an inch in depth at each 10 feet. Sometimes I have placed Roman numerals alongside the

the purposes above set forth it will prove of great value to the practical mine superintendent.

### A Mexican Gold Mine.

In northern Sonora, Mexico, is a group of gold properties known as the Lucky Tiger Combination. The property is in the Moctezuma district, near the town of Opoto. The offices of the company are in Douglas, Ariz. The mine, when discovered, was far from public highways or railroads, and the first thing the company did upon coming into possession of the property was to build a good wagon road over which to transport supplies to the mines, and to take out ore. The accompanying engravings convey a good idea of the country through which the road was built, and also something of the nature of the mining work since done there. The ore bodies have been extensively developed since then, and it is said there is a large body of free milling ore in sight, beside which hundreds of tons of high-grade ore have been shipped to smelters. The veins are large and well defined, having heavy iron outcrops. Minerals present are gold, silver, silver sulphides, galena, zin



blende, wulfenite, and a variety of secondary products of the oxidation of the sulphide ores. Some of the ores offer difficulty in treatment, due to the presence of antimony. Manganese oxide and copper are also found in some parts of the mine. The wall rocks contain a great deal of finely disseminated pyrite, but this is usually low grade. There is an abundance of timber available, and the water supply is said to be sufficient for present needs.

### Place and Value of Small Scale Ore Tests.\*

NUMBER II—CONCLUDED.

Written by ERNEST H. SIMONDS.

In order that the results of laboratory tests may be reliable, it is necessary, of course, that the sample on which the tests are made should correctly represent the ore which is to be worked. The only proper way to take this sample is to take samples throughout the mine in exactly the way that would be done if the mine were being examined for sale. In quartering down the sample to get the assay pulps, two quarters are saved after the sample has been crushed to  $\frac{1}{4}$ -inch mesh. After the samples have been assayed, so that we know which represent ore and which waste, an amount of each one of the samples representing ore is weighed out which cor-

The work is checked by the values as shown by the assays of the ore being accounted for in the products; 30.75 grams of mercury were used in this test, and only 26.1 grams of amalgam recovered, the amount lost, about 15%, going into the concentrates. The amalgamation part of the test was, therefore, repeated; 30.20 grams of mercury were used, 29.95 grams of amalgam recovered and an extraction of 32.6% of the gold and 0.7% of the silver obtained. Allowing for the loss of amalgam in the first test, the extraction of the gold would be 33.6%. As a further check on the test, it may be mentioned that while the average assay of the mixed slimes and tailings in the test is 0.075 ounce gold and 7.15 ounces silver, the tailings from the fifty-ton mill, whose feed was accurately represented by the sample used for the above test, assayed at the same time 0.07 ounce gold and 7.15 ounces silver.

The above test shows, besides the assay values of all products and the percentage of total value in each product, that there will be an extraction of 88.75% of gold and 58.3% of the silver, and that the ore was crushed too fine, since the slimes assay higher and contain a larger percentage of the values than the sands.

In making the above test, the ore crushed to a size corresponding to the 35-mesh on the battery, was shaken hard for one-half hour with the mercury and water so as to flour the mercury through the ore well; the pulp was then diluted and the mercury sep-

slimes were separated, weighed and assayed, giving these results:

Product.	Gold Assay Value.	Per Cent by Weight.	Per Cent of Value.
Sands.....	\$2.80	77.25	64.7
Slimes.....	5.25	22.25	35.3
Total.....		99.50	

Hence both sands and slimes are valuable and will need to be worked. A test in a percolator showed that the tailings as received—the slimes and sands together—leach readily. Therefore, it would appear that amalgamation and concentration are extracting all that they can, but that the tailings may probably be treated without difficulty by cyanidization. As showing that small-scale tests agree with mill operations, I may mention that, on reporting as above, I was informed that they were already cyaniding the tailings with success, but had the test made in order to satisfy themselves that the mill was doing as well as it could before cyaniding.

To show what can be done in the investigation of sulphurets by small tests, I give the following results:

Test.....	1	2	3	4	5
Mesh.....	Conc.	Conc.	Slimes.	Slimes.	P. Tails
Weight of ore, grams.....	50	50	50	50	100
Strength solution, lbs., per ton.....	2	5	2	5	5
Volume solution, grams.....	200	200	200	200	100
Lime, per ton, lbs.....	5	5	5	5	5
Consumption, lbs., per ton ore.....	4.4	6.8	0.8	2.0	Lost
Assay tailings.....	\$4.55	\$3.30	\$2.96	\$2.05	\$0.30
Extraction, per cent.....	80.4	86	89	92	80

The results show conclusively that these slimes and



Lucky Tiger Mines, Sonora, Mexico.

responds to the stoping width at the point where the sample was taken. These samples are thoroughly mixed, and we have a sample for the tests which is an epitome of the mineable ore in the deposit as shown by the present state of development of the mine. Besides this average composite sample, on which all extraction tests will be made, specimens should be taken of varying aspects of the ore, showing the condition of the gold in rich specimens, the different sulphides in the mine and the character of the wall rocks. These are taken to show the form of the gold, silver, copper or lead minerals, and to make it possible to determine, by assays of different specimens, with which minerals the values are combined.

In order to exemplify the variety of information which may be obtained in regard to an ore by simple laboratory tests, I will outline the methods and state the results of a few such tests:

#### I.—LABORATORY MILL TEST.

Product.	Weight.		Assay.		Product Contained Per Cent of Values in Ore.	
	Grams.	Per Cent.	Ounce Gold.	Ounces Silver.	Per Cent of Gold.	Per Cent of Silver.
Ore.....	1000	100.0	0.50	13.75	100.0	100.0
Amalgam.....					29.25	0.7
Concentrates.....	322	22.2	1.34	35.70	59.5	57.6
Sands.....	418	41.8	0.035	2.25	3.0	6.9
Slimes.....	362	36.2	0.12	12.80	8.0	33.7
Totals.....	1002	100.2			99.75	98.9

\*Trans. Cal. Min. Assn.

arated by vanning, the sulphurets being then concentrated out by about a dozen washings on a batea 14 inches in diameter, washing back and forth from one disban to another, until it was seen that the tailings were about as free from sulphurets as vanners well run could be expected to leave them—say, not more than 5% of the mineral originally present. The concentrates were not allowed to have more than 15% of gangue. The slimes were separated from the sands by decanting the muddy water, adding clear water, agitating and decanting again, this being repeated until the water came off clear. Each product was then dried, weighed and assayed. The concentrates can be analyzed for copper, lead or anything likely to affect their further treatment, while the sand and slimes can be used for tests by cyanidization.

To show what can be done by small tests in showing how to reduce the values of the tailings in a mill already running, I will give the following results on a sample of tailings assaying \$2.95 per ton in gold. Exactly the same laboratory mill test as above outlined was made on the tailings as they came from the mill. Two thousand grams were used for the test. The amalgam contained only 0.10 milligram of gold, indicating a value of only 3 cents in free gold per ton of tailings. There were only a few specks of pyrite or heavy concentratable mineral of any kind—surely less than one-tenth of 1% of the ore by weight. The concentrates were, accordingly, not saved but allowed to go in with the tailings. The sands and

sulphurets, when ground fine, give a good extraction<sup>1</sup> with a small consumption of cyanide.

Another lot of sulphurets carrying fifty-six ounces of silver and one ounce of gold was tested in the same way and found to give an extraction of only 40% of the silver and 70% of the gold. Tests were then made by roasting the concentrates in a large, new muffle and smelting them together in a graphite crucible with ore from the same mine carrying 22% of sulphurets, using equal weights of roasted concentrates and raw siliceous, sulphide ore. Two thousand grams were used for the roasting test and 500 grams for the smelting test. It was found that there was no loss of either gold or silver in the roasting; that the smelting gave a matte fall of 14% of the weight of the charge, effecting a concentration of 7 into 1, the matte assaying 6.50 ounces gold and 285 ounces silver, and effecting a saving, even in the crude work done in the small crucible, of 96% of the gold and 91% of the silver.

There are certain general considerations which, it seems to me, have never been stated with sufficient clearness in the treatment of this subject, and I am glad to present them to you:

1. The purpose of any test, however made, is to get information and not to work ore.

2. Some things about an ore are just as well represented and just as evident or capable of being found out in a representative pound sample as in a mine full. For example, lots of one to several carloads are valued on the smelting, in assaying, of



a few ounces of ore more accurately than in any other way. Within my experience, lots of rich material worth \$10,000 to \$25,000 have repeatedly been valued with an agreement satisfactory to all concerned by a smelting of less than an ounce of the pulp. Just as the value of ore can be accurately determined by small scale tests, so can many of its other characteristics.

3. A very wide range of information can be obtained quickly and cheaply.

4. Ore tests are either mechanical, as concentration, or chemical, as smelting tests, in their nature; or they may partake of both, as in leaching tests.

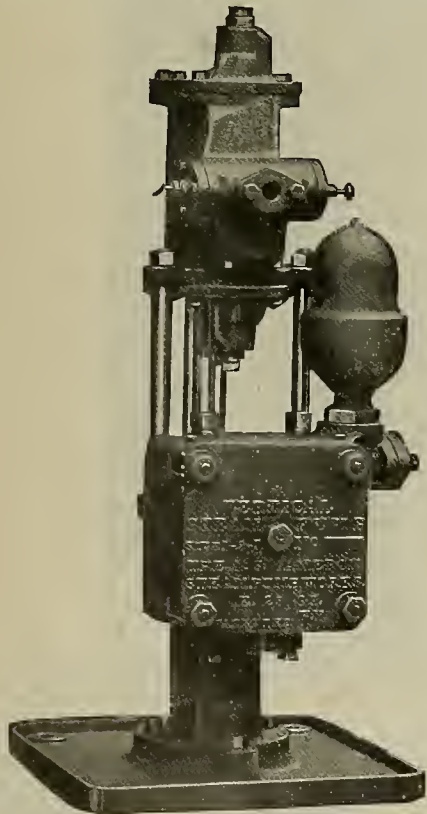
5. The purpose of a laboratory test, either of ore or of mill products, should not be to parallel the mill, to determine how much some old machinery, perhaps insufficient in amount, deficient in design or unskillfully run, will extract, but to determine what percentage of the values in the ore can be extracted by the best possible plant.

6. Small scale tests have the advantage that all the details are under ready control, difficulties of sampling are obviated or minimized and the "clean-up" can be performed with an accuracy approaching that of chemical analysis. Only fifty pounds of a representative sample is sufficient for a large number and great variety of tests. The results serve, we might say, as a small scale or key map to indicate in what direction to make tests in greatest detail, where the correct solution is to be found.

In conclusion, we may say that the results of small scale tests chemically may be relied upon with confidence, but mechanically they need to be interpreted by one familiar with the work both in the mill and in the laboratory. While their results are not precise, they are approximately correct, if made with good judgment, care and skill on representative samples. They not only give a wide range of information as an aid in deciding upon the best general method of treatment, but they give the best help to be had in investigating difficulties and improving details of a method of treatment already in use.

### Vertical Boiler Feed Pump.

The Cameron vertical boiler feed pump is illustrated herewith. The photographic reproduction shows a



Vertical Boiler Feed Pump.

plain unassuming vertical piston pump on base. Its makers assert that it possesses every necessary attribute of a perfect direct-acting pump, occupying but little space and giving the maximum capacity. Although shown on a base plate, it is sometimes preferred for marine use to bolt the pump, by means of lugs cast on the back, to the bulkhead. This has been done in the case of pumps of this type furnished to the smaller gunboats and which have seen service in the United States navy. In common with all Cameron pumps, no working part is exposed except a small part of the rod, which may also be covered, if necessary. The makers say the steam end may be adapted to work any steam pressure, no matter how high, and the water end is fitted with Cameron patent priming valves, and a removable bushing or lining, which may be taken out and replaced with a new one in a few minutes, thus avoiding any delay when it becomes necessary to renew the working barrel of the cylinder on account of wear. Those

desirous of further facts relating to any type of pump made by the A. S. Cameron Steam Pump Works can address foot East Twenty-third street, New York City, N. Y., for pamphlet.

### The Bullfrog District, Nevada.

TO THE EDITOR:—Bullfrog district is situated in Nye county, in the southern portion of the State of Nevada. It can be reached via Tonopah and Goldfield, or from Los Vegas, a station on W. A. Clark's new railroad which runs from Los Angeles, California, to Salt Lake City, Utah.

The district is on a spur of the Grapevine range of mountains through which courses the Amargosa river, whose bed is dry for the greater part of its length. Water can easily be obtained, however, by digging down a few feet, and at intervals a small stream can be seen flowing, but it is soon swallowed up by the dry and greedy sands.

There are four so-called towns in the district—Bullfrog, Gold Center, Beatty (which is the post-office), and Rhyolite, near which are grouped the principal mines discovered up to the present.

The original Bullfrog mine, which gave its name to the district, is about 3 miles west of the town of Rhyolite; it is a "blow out" of quartz between limestone and porphyry rising up into a small knoll at the base of the main range having almost the appearance of a small butte rising directly out of the plain. It is apparently about 300 feet in length, 200 feet in width, and 75 feet in height above the surface at its base. A drift has been run into this little knoll of quartz 100 or more feet and four crosscuts from this main opening show the quartz body to be seamed with horizontal and vertical strata of a greenish, bluish-colored ore resembling both malachite and lapis lazuli. It is called by some bromide of silver, but regardless of its exact name there is no mistake to be made in calling it high grade ore. The purple-bluish mineral is fluorspar. The ore strata are from 1 inch to 6 inches in thickness, "criss-crossing" in many places and forming a network. Free gold is easily discernible to the naked eye in the greater portion of these greenish-colored streaks; the statement made by the management that a shipment of ten tons of assorted ore yielded in the neighborhood of \$1000 per ton in gold and silver can be readily believed, and the additional claim made that the ore body for 50 feet in width will average \$50 per ton does not seem unreasonable. The Denver, Montana-Bullfrog and Tonopah-Bullfrog, the National Bank and Shoshone mining claims, the latter owned by E. A. Montgomery, are within a stone's throw of the town of Rhyolite. All of these properties show high-grade gold and silver ore. The Shoshone or Montgomery claim, situated on the divide between the towns of Beatty and Rhyolite, is a porphyry dike between altered rhyolite and trachyte walls. The dike is fully 50 feet in width, as disclosed by a cross-cut tunnel driven into it, and shows good ore its entire length. A width of 27 feet of this ore is said to average \$200 per ton in gold and silver. Ore is being sacked and shipped to the smelter via Los Vegas as fast as teams can be engaged.

The miner who comes into this section to prospect for or to purchase mines must not expect to find "regular fissure veins." There are no croppings of pay quartz with regular walls, clay gouges, slickensides, etc. The base of the mountain chain here is limestone through which the rhyolite peaks have been pushed upwards; flanking these craggy crests and ridges, spires and minarets of black and chocolate hued rhyolite, are dikes and bands of white porphyry and altered trachyte, coursing north and dipping to the east. From a superficial point of view the geology of the district does not seem at all complex, and judging from the mines already discovered more will be found in the shape of ore chimneys capped over, but near the contact of the clay porphyries with dissimilar formations.

From the excellent showing so far made here it is surprising to find so little actual mining work going on. Not over fifty miners are employed in all the mines in this neighborhood and miners in search of employment will be disappointed if they come here expecting to find ready work at the present time.

The district has been staked solid for 9 miles in all directions from the sagebrush flats, including part of the desert, to the tip of every summit in sight. Some have located as many as 100 claims. According to the local laws, all locations must have their corners put up and assessment work done within ninety days after locating the ground. If honestly adhered to, this rule would call for much assessment work, but it is evaded by the wily land grabber, who finds it easier to relocate his ground before the expiration of the ninety days prescribed than to comply with the law. Of course this hoggish policy is keeping the district in the background, as very little development is being done away from locations contiguous to the few mines discovered which show pay rock. Locations in the neighborhood of mines that have a showing of ore sell readily whether they have anything in sight or not. Claims with nothing but sagebrush, greasewood and four stone monuments in sight, provided they are in the neighborhood of pro-

ducing claims, sell for \$500 to \$2000 in cash. Town lots sell for \$25 to \$1000. There are very few lumber buildings, nearly all the towns being made up of tents. Water is \$2 per barrel, hay \$100 per ton, lumber \$112 per M., freight \$80 per ton, flour \$8 per 100 pounds. Supplies of all kinds excepting lumber are here in fair quantities. As yet the weather is quite cold. Although warm in the middle of the day, three pairs of blankets are a necessity at night; thermometer ranges from 94° to 20° during each twenty-four hours. There is no sickness; every one seems happy, healthy and confident of the future.

Rhyolite, Nev., April 20. CHARLES L. LANO.

### THE PROSPECTOR.

The prospector can make a convenient set of instruments for testing the hardness of minerals by securing suitable small crystals or fragments of the harder minerals. These can be inserted in jewelers' cement set in the ends of penholders. This makes a convenient instrument for the purpose and not easily lost. The prospector should have all the minerals of the scale of hardness, except the diamond, which is not necessary. The minerals of the scale are as follows: 1. Talc (the steatite or French chalk of the tailor). 2. Gypsum (selenite, the transparent variety). 3. Calcite (crystallized, also called Iceland spar, and determined by its strong double refraction). 4. Fluorite (the fluorspar of the lead and zinc mines, also abundant in Cripple Creek, Colo., in the northern Black Hills, Castle Dome and elsewhere in Arizona, and recently found in the Bullfrog district of Nevada). 5. Apatite (a calcium phosphate). 6. Orthoclase (the common potash feldspar of granite, often pink in color). 7. Quartz (crystal). 8. Topaz. 9. Sapphire. 10. Diamond. Topaz is not usually easy for the prospector to get, nor is the sapphire; but for the latter corundum may be substituted. The diamond is unnecessary, as any mineral which corundum will not scratch is probably diamond. A small file and a good knife are useful in testing the hardness of the softer minerals, from talc to orthoclase. The relative hardness of these minerals is determined by the amount of pressure necessary to scratch it with a knife or file. The edge of a broken plate makes a good streak plate, but usually the streak can be determined by means of the knife or by pulverizing a small fragment and noting the color of the powder. A small magnet is also useful, as well as small bottles of nitric, sulphuric and hydrochloric acids and ammonia. All these must have glass stoppers. Hypo-sulphite of soda and sodium or calcium sulphide are useful to test silver chlorides and bromides.

The rocks from "W. B.," Challis, Idaho, are volcanic rocks and both are of the type known as amygdaloid. No. 1 contains abundant zeolites, both white and green, and also a smaller amount of chalcedonic quartz. No. 2 contains mostly chalcedonic quartz, with a few zeolites. The latter are decomposed by hydrochloric acid. These rocks were originally fluid lavas flowing on the surface and were filled with bubbles of air or gas. Subsequently, on cooling, these gas vesicles were filled by the infiltration of chalcedony and zeolites. The rocks contain no ores except those of iron—magnetite. The green color is probably due to iron silicate.

The rocks from Sberidan, Mont., are: No. 1, hornblende granite. It consists chiefly of hornblende, quartz and feldspar (orthoclase and plagioclase). No. 2 is similar to aplite in composition (quartz and orthoclase), but is coarser in grain than typical aplite. It also inclines to graphic granite, but is not typical. It is a micaless granite. No. 3 is augite granite, an unusual rock. No. 4 is a fine-grained biotite granite. No. 5 is chiefly limonite—iron oxide.

The three mineral specimens from Canyon Ferry, Mont., are hard hematite, an ore of iron, very common in nearly all placer mines. It resembles tinstone, perhaps, to the unpracticed eye, but it is softer and of a lower specific gravity than cassiterite and lacks the luster of the latter. Tinstone makes a pearly brownish to gray powder, hematite a red, earthy one.

The rich, deep azure blue found in ores is usually azurite (the blue copper carbonate). There is no silver bromide known having this deep-blue color. When silver bromide is so colored it is due to the presence of copper carbonate. Silver bromides and silver iodides are usually of a peculiar greenish yellow cast and can not be called blue by any one who is not color blind.

The mineral specimens from Isabella, Cal., are: No. 1. Zincblende, with quartz; a little yellow copper ore; chalcocopyrite. No. 2. Garnet.

THE Broken Hill mines of New South Wales were discovered and opened in 1884-85. They at first produced lead-silver ore in great quantity. The zinc and copper were developed in the deeper workings of the mine.



## Precipitation of Gold and Silver From Cyanide Solutions.\*

Written by W. J. SHARWOOD.

The cyanide process for extracting gold and silver from ores and tailings has now been practiced on a large scale for about fifteen years, though occasional attempts had been made long before to utilize the solvent action of alkaline cyanides on gold. When once established as a working process, numerous methods of increasing its efficiency suggested themselves, and many real and supposed improvements have been proposed, some dealing with the mechanical problems of handling the material, others with the dissolving of the precious metals, and others with the equally important question of getting them out of the solution again. In this paper I wish merely to treat of some of the details of the latter question—the recovery or precipitation of gold and silver from their cyanide solutions.

In considering this subject, one point is to be noted. Most other processes in metallurgy consist of a series of steps, in each of which the valuable contents of the original material are concentrated to a greater or less extent. Thus, in smelting a 15% copper ore we would get probably a 50% copper matte, or in chlorinating sulphurets worth \$100 per ton we would get a solution much richer in gold. In the cyanide process, on the other hand, the dissolving of the gold generally gives us a solution poorer in gold than the material originally treated, for the weight and volume of the gold-bearing solutions are usually considerably greater than those of the tailings or ore. Thus, at a slime plant using decantation, where from three to five tons of solution are obtained from one ton of slime, the average solutions are necessarily of very low grade. For instance, at one plant over a thousand tons of solution are precipitated daily, of an average value of less than 50 cents per ton in gold, or less than one part of gold in a million. From solutions so dilute as this it is not as easy to secure a high percentage of precipitation as from the rich solutions which are often used in laboratory tests.

Of the gold in a cyanide solution, the greater portion of it can be quite readily precipitated, but it is a more difficult matter to get out the last few per cents, and almost impossible to extract the last trace.

One often hears the expression, "Precipitation at this plant is practically perfect," when, as a matter of fact, 20 cents to 30 cents' worth of gold may be left in every ton of the solution. As the solution is to be used over again, this gold may not at first sight seem worth troubling about, but it must be remembered that it is impossible to recover all of the solution run upon a charge. Whether it is leached or agitated, a certain proportion is retained, no matter how thoroughly washed, and especially is this source of loss to be considered in the case of solution which is to be added just before the "wash water" of the leaching process, or in any of the later "washes" of a decantation system. The question as to how closely it pays to precipitate should be looked into carefully—a comparatively rich solution may be run with safety upon a free-leaching charge in its earlier stages, but solution added toward the end should have been precipitated as nearly perfect as possible. In the decantation process it is easy to calculate how large a proportion of any particular wash is going to be thrown away with the residues. Methods of precipitation may be classified into:

**CHEMICAL METHODS.**—That is, precipitation by addition of salts or acids, or by passing gases into the solutions. These methods, I believe, without exception, render the solution unfit for use in treating further quantities of ore, unless some further treatment is applied. Hence, as a rule, they are only available for solution which is to be run to waste.

**CHARCOAL PRECIPITATION.**—Filtration through charcoal is in use in certain parts of Australia, the material being revived by occasional reburning, while a cleanup is conducted by burning the coal and fluxing the ash.

**ELECTROLYTIC METHODS.**—Precipitation by a current from a dynamo or other outside source. This may be applied in two ways: First, to the clear solutions obtained by the leaching or decanting process; second, to the cyanide pulp itself while in course of agitation, as in the processes of the Pelatan-Clerici class.

Another electrolytic system now uses iron plates, covered on one side with a carbonaceous coating, the gold being deposited on the unprotected side. The tank is filled up with solution; this remains until practically all the gold is precipitated, when the solution is drawn off and a new batch is run in. The process is, therefore, an intermittent one.

**PRECIPITATION BY METALS IN A FINELY DIVIDED STATE.**—The more electro-positive metals or their alloys can be used. Aluminum, sodium amalgam and zinc are about the only ones economically possible, while only zinc and its alloys have so far stood the ordeal of practical work.

(TO BE CONTINUED.)

\* Abstract Trans. Cal. Min. Assn.

## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

W. Scott has commenced work on the Vulcan M. Co.'s tunnel on Silver Creek mountain, near Windham.—E. Wisnom and A. Bergen are building a bridge for the Golden River M. Co. across the Shuck river near the Ten Mile canyon, near Windham.—E. E. Taylor is building a 1-stamp mill on the Jack Pot quartz claim, near Loch Mary.

The Apollo M. Co. is running a crosscut tunnel on Unga Island, in Behring sea, 800 miles west of Nome. Louis Schloss & Son of San Francisco are reported to have a 60-stamp mill on the property. F. R. Brown is superintendent.

### ARIZONA.

#### Gila County.

H. Strong, who is in charge of the Pinto Creek M. & S. Co.'s mine, the Yo Tamhien, in the absence of Superintendent D. P. Fuller, reports that good progress is being made in driving the lower tunnel, although the ground is very hard. Machine drills are being used.—F. Thompson is developing claims 12 miles south of Bowie.

#### Mohave County.

Work on the Elkhart mine, at Chloride, is expected to have the mine unwatered and sinking in progress within a month. It is reported that they will unwater and work the Tennessee and Schuylkill mines, which carry high-grade lead ores.—L. D. Godshall, manager of the Arizona-Mexican M. & S. Co., has let a contract to sink 100 feet on the Twins mine, Cerbat.—It is reported that rich ore has been found in the stope from the tunnel level of the New Jersey mine, near Chloride. T. B. Lamb has charge.—L. B. Davenport reports that in the bottom of the lower tunnel on the Eldorado mine, Gold Basin, a 10-inch streak of ore was recently cut that gave an average value of \$4 a ton.—The Blue Ridge M. Co., near Vivian, is running its mill on ore from the Hilly mines. It is reported that a larger saving of values is being made than at first expected and that for the present it is not intended to put in a cyaniding plant.—T. McMahon is opening a copper property below the Alpha mine, at Layne Springs.

#### Pinal County.

(Special Correspondence).—At the McCallum-Schillings property the mill has been started up. The Big Lead M. Co., operating this property, is opening up the 130-foot crosscut level.—For the Middy mine, 1½ mile from Kelvin, 300 feet of track and a car have been put in, to be used in running a 300-foot tunnel in the mine. Kelvin, April 24.

Superintendent W. B. Twitchell of the Big Lead M. Co., operating the McCallum-Schillings property at Ray, has started up the old Bobtail mill, on ore from the Big Lead. They are opening up the 130-foot crosscut level. They expect to put in a leaching plant as soon as the storms are over.

#### Yavapai County.

(Special Correspondence).—M. J. Brophy and F. S. Douglas have sold the Garfield mining claim at Junction for \$112,000. Junction, April 24.

#### Yuma County.

(Special Correspondence).—A Los Angeles company has been organized to work placer ground 10 miles from the Colorado river, in Yuma county. The company is known as the Gold Placer Prospecting Association and is planning to put in machinery and work the claims. Yuma, April 24.

### CALIFORNIA.

#### Amador County.

The Bunker Hill mill, near Amador City, has been temporarily hung up while more development work is being done in the mine.—The last payment on the Bay State, now a part of the Rbeta Con. M. Co. of Plymouth, has been made. The 10-stamp mill is running steadily. At the Bay State the shaft is down 1030 feet.

#### Calaveras County.

It is reported that the 3-stamp mill of the Red Bird mine, near Vallecito, owned by C. D. Smith, is to be replaced by one of greater capacity.

#### El Dorado County.

The Gold & Silver mine, between Placerville and Kelsey, is employing twenty men and a mill is to be built.—The New Highland G. & C. M. Co. is preparing to commence work on a tunnel to tap new ground on the Mameluque Hill, near Georgetown. The tunnel will be started in Illinois canyon. The mine will be operated by the hydraulic process and the debris will pass out through sluice boxes placed in the tunnel.

#### Fresno County.

It is reported that the Associated Oil Co. (the Southern Pacific Co.), which has no contracts in the Coalinga oil field, has taken advantage of the increased production in the district to cut the price of oil to 15 cents per barrel. The Coalinga Oil Transportation Co., which is the only important rival of the Associated in the local fuel-oil market, is shipping as much oil as the latter, its receipts being principally from holders of contracts at 19 and 20 cents. The Coalinga oil producers have completed plans for the construction of a pipe line from the oil field to Alviso, at the southern end of San Francisco bay.

#### Mariposa County.

H. L. Waste, assistant manager for the M. C. & M. Co., is running the ashes from the Mariposa mill, recently burned, through sluice boxes, as considerable gold and amalgam were in the floor and the troughs.

#### Mono County.

General Manager W. A. R. Loose of the Field of Gold M. Co. of Masonic and Bodie, Ed Loose of Utah, J. E. Twelves of Provo, Utah, and W. Hatfield have taken up 800 acres of land and a water right on the Walker river, 6 miles below Bridgeport. It is reported that they will put in an electric power plant to transmit power to Bodie, through Masonic and on to Tonopah. A flume 3 miles long, containing 2,000,000 feet of lumber, will be built to gain the power required. The old Syndicate mine in Bodie is under their control and the mill is being refitted preparatory to continuous work.

#### Nevada County.

The machinery on the Great Dane mine, at Selby Flat, is being moved to the Morning Star mine, at Badger hill, 6 miles from Nevada City. The Morning Star is being opened by P. Deidesheimer & Co., and the shaft is down 70 feet.—It is reported that rich rock has been found in the Ethel mine, near Gaston, which is being worked by Maltman, Humphrey, Myers & Goodwin, who intend to build a 10-stamp mill.—At the Star mine, near Gaston, the tunnel is being extended.—Over eighty men are employed at the Gaston mine and the big mill is kept running night and day, by Superintendent F. Miller.

It is reported that the North Star M. Co. is to build an electric road from the North Star mine to the Central mill and cyanide plant, replacing wagons now in use.—C. L. Canfield, head of the drift mining enterprises A. Blue Tent and Grizzly Hill, north of Nevada City, has secured 2700 acres of gravel mining land, beginning at the Blue Tent claim and extending along the main Red Dog and You Bet channel to Scott's Flat for 3 miles. Surveys are being made for roads and for the bedrock tunnel, which is to head in Sailor ravine, from which point it will have to run about 3000 feet to reach the channel. As soon as gravel is reached a 40-stamp mill is to be erected in Sailor Flat ravine, near the mouth of the tunnel.

#### Placer County.

(Special Correspondence).—The Belvue mine at Ophir, under the direction of P. Cozano and A. N. Buchanan, made a recent shipment of thirty-four tons which is reported as giving eighty-seven ounces free gold. Auburn, April 26.

The Cash Rock mine at Forest Hill has commenced work for the season under the supervision of R. Jones.

#### Plumas County.

The Northern placer mine, near Cromberg, has been bonded by P. Traynor to Long & Cronan of San Francisco. W. E. Ramsdell is superintendent at the mine and will start hydraulic mining.

#### Shasta County.

(Special Correspondence).—The smelter of the Great Western Gold Co. was shut down temporarily to repair a turbine pump, and not because of fault in the process. The construction of roasting stalls is contemplated to treat some of the ores more economically. H. Haas has charge of the reduction works. Ingot, April 25.

It is reported that a 700-ton smelter is to be put in at the Balaklava mine, near Kennett. P. L. Kimberley of 220 Bush street, San Francisco, Cal., is president.

Manager L. T. Wright of the Mountain Copper Co. says that the smelter at Keswick will be closed about May 5, so that a part of the machinery can be moved to the new smelter being built at Bull's Head Point, near Martinez, Cal.

#### Sierra County.

Superintendent W. D. Pinkston of the Sierra Buttes mine, at Sierra City, has made arrangements to put in a new 40-stamp mill and cyanide plant.

#### Siskiyou County.

The Yreka Creek Gold Dredging Co. has bonded land along Yreka creek and is building a modern dredger to be run by electricity. E. T. Wallace of Yreka is vice-president.—J. S. Beard, C. W. Nutting and F. G. Smith of Etna have bonded the Steamboat and the Accidental gravel mines on McAdams creek to W. A. Fish of Tehama, who proposes to dredge the gravel.—It is reported that the King Solomon Co., near Black Bear, have struck their ledge and will resume work under direction of W. H. Young.—The tunnel being run at the Black Bear mine to tap the lower works is in 150 feet.

It is reported that F. T. Marker, of Nevada City, has bonded the Jim Wayne, above Fall creek, near Thrall, to a San Francisco company of which C. W. Porterfield is superintendent. A small force is now at work and more will be put on later.

#### Trinity County.

G. W. Payne, manager of the dredger at Trinity Center, will soon start the season's run.

#### Tuolumne County.

The Mohican, near Tuolumne, has resumed operations after a shut-down of a month on account of lack of fuel. Extensive repairs were made and the mine and mill are now in first-class condition.—A company has been formed at Bangor, Me., to operate the Arrow mine, near Sonora, under the direction of G. Dean.—F. J. Gross has sold to W. R. Gillis of Tuttle town the New Year quartz claim, ½ mile north of Tuttle town.—Rich gravel has been struck in the Buckeye tunnel on Table Mt., at Mormon creek, near Tuttle town. The property is under bond from W. Stinchfield and is operated by T. A. Piper and associates.

#### Yuba County.

Drilling has been commenced at the Dunning ranch, near Marysville, by the Yuba Dam Gold Dredging Co. G. L. Proctor, of Rio Vista, has charge.

### COLORADO.

(Special Correspondence).—The U. S. Mint at Denver shows an increase of deposits over last year. The hullion is being held awaiting the completion of the coinage department. Since Jan. 1st this year there has been over \$8,000,000 in gold deposited at the mint. About 250



people will be employed at the new mint when they start coining.  
Denver, April 25.

#### Boulder County.

W. P. Marshall reports a rich strike in the Last Chance mine, in the Jamestown district. The property is owned by William Marr of North Park.

#### Clear Creek County

There are five sets of leasers working in the different veins recently opened in the Princess of India tunnel near Idaho Springs, which is being driven by Omaha capitalists. It is reported that the Torpedo tunnel on Springs gulch is to be started. This tunnel is owned by the Idaho Springs Gold Producing Co. and has been worked in a desultory manner the past winter. J. Hull of Idaho Springs is manager. The Torpedo tunnel is 1400 feet. The Lake mine in Virginia canyon is shipping ore to the Bonetta mill in Idaho Springs. The Roberts mill has put in a new 10x15 crusher.

#### El Paso County.

The Colorado City Oil & Gas Co. intends to sink a 3000-foot well near Colorado City to prospect for oil and gas. W. P. Epperson of Colorado City is manager.

#### Gilpin County.

A good strike is reported from the Boston lode on Stewart mountain, near Central City, by M. Kane, who has been driving a tunnel on this vein, which is now in 200 feet.

As a result of the experiments at the Petersen mill, in Lump Gulch, the Gold Dirt M. & M. Co., J. R. Anderson manager, is putting up a 50-ton plant in Gambell gulch, near Perigo. The mill is to be equipped with ten 1100-pound stamps and is expected to be finished by June 1. Sinking has been stopped in the Gold Dirt shaft for the present, at depth of 700 feet, and crosscutting to the south to cut the vein has been commenced. It is the intention of the company to convey the ores from their main property through the tunnel level, where an upraise is being made for a shaft, the ores to be hoisted through this shaft to the upper part of the mill. It is reported that the Perigo mill, in Gambell gulch, is to be started for a short run on Perigo ores. It is reported that the Blue Grass M. Co. will start work at Phoenix. The Mountain Monarch M. Co., in Gambell gulch, will extend their tunnel to the Seth Thomas vein. They may put up a 10-stamp mill. J. C. Barrows is manager. The Interstate Con. M. Co. has started work on their Happy Hollow group, near Gambell gulch. The new shaft is to be sunk 50 feet with windlass, after which the company intends to put in machinery for deeper operations. The Elk Park M. Co., west of Apex, will work the Annie H. under direction of Manager C. A. McNeil. The Imperial G. M. & M. Co., L. J. Mountz of Apex manager, will resume work on the Mackey mine.

#### Hinsdale County.

M. J. Elbert is working the Nelly Bly property, on the east side of the Lake Fork, near Lake City. G. H. Martin of the Hanna M. Co. has made arrangements with F. W. Sherman to remodel the mill at Capitol City. Manager Dryden has closed down the Pelican mine, near Lake City, during a trip to Boston, when he will arrange for an air compressor.

G. H. Martin, president of the Hanna M. Co., operating the Moro mine at Capitol City, contemplates remodeling the Hanna milling plant.

#### Lake County.

(Special Correspondence).—The smelter at Leadville was crippled for a few days on account of the weighing and wheeling gangs going out on a strike. It is understood that agitators have been at work in the district endeavoring to unionize the men. The new eight-hour law does not affect the men on strike and for this reason a strike was called to compel the smelter to grant them eight hours. The strike has been settled satisfactorily to all.

Leadville, April 25.

C. R. Osgood and associates of Leadville have a lease and option on the Ballard and President claims on Breece hill. The Ballard was the first mine in the camp in which hismith was found and for several months a streak 5 feet thick was mined and shipped to Europe. Both shafts will be sunk deeper in an effort to locate the ore channels. From the upper workings of both claims ore will be shipped that will more than meet the running expenses of the mine.

J. L. Craig of Twin Lakes has bought the holdings of the Mount Elbert Co., 2 miles from Twin Lakes.

#### La Plata County.

Rich discovery of gold is reported on the lower end of the Florida mesa, near Durango, on the ranch of H. N. Spinning.

#### Ouray County.

Work on the Blowout tunnel at Ouray is progressing at the rate of 2½ feet per day by hand work. The tunnel is 400 feet in length and 6x8½ feet cross section. It is proposed to put in power drills. Arps Bros. have acquired forty claims in Porphyry and Mineral basins, near Ouray, and have started work on a development tunnel which will be at least 4000 feet long. The purpose of running the tunnel is to cut a number of well-defined veins, among them being the Tomboy, Smuggler and other Marshall basin veins which apparently traverse this group. Where prospected on the surface the veins all show good gold and silver values.

#### San Juan County.

The Auburn Con. M. Co. on Tower mountain, near Middleton, has driven a 200-foot tunnel to cut the Auburn vein and intends to put in an 8-drill air compressor, drills and a new 80 H. P. hoiler.

A. J. Aurand is pushing work in the crosscut tunnel being driven to cut the Bullion King vein, Porphyry basin, near Silverton. The Shenandoah mine, King Solomon mountain, has commenced shipping copper-silver galena ore. Work is to be started on the Missouri Fred on the range between Boulder and Tower mountain.

The Gold Prince M. & M. Co. has made arrangements to build a 100-ton concentrating plant on the company's property in Mastodon gulch, above Animas Forks, 15 miles north of Silverton. A 2-mile tramway is to be built from the mine to the mill.

#### Sommit County.

The Union mill, near Breckenridge, has been completed. It is equipped with eight Wilfley tables, two Wilfley slimers, one crusher, two sets rolls, four Hartz jigs and three screens. Heavy machinery is being placed on the Reliance dredger, near Breckenridge, by E. Smith. The Summit county placer deposits occur in low flats and bars along the stream beds or in ridges or benches above the level, but adjacent to the streams, these latter being known as hench diggings. The beds are composed mainly of coarse gravel, some clay and a few large boulders. The gold is comparatively coarse, bright and clean.

#### Teller County.

(Special Correspondence).—The apex suit of the Morning Glory against the Mary McKinney has been compromised in the Cripple Creek district. It is understood that \$100,000 is the amount agreed upon.

#### Cripple Creek, April 25.

The jury in the Portland mining suit, in which James Doyle sought to recover \$1,000,000 which he alleged was due him for his interest in the Tidal Wave, Bobtail No. 2 and Devil's Own claims at Cripple Creek, now a part of the property of the Portland M. Co., have decided for the defendant. Suits for damages aggregating \$1,000,000 have been filed in the State and Federal Courts by the United States S. & R. Co. and a number of Cripple Creek mining companies against the Western Federation of Miners and its officers. The complaints are all of similar nature. They charge the defendants with unlawfully conspiring to injure the plaintiffs by preventing the mining and shipment of ore. The Vindicator G. M. Co. asks for \$20,000 damages for losses occasioned by the stoppage of its pumps. The suits are the outcome of the strike which was ordered in the Cripple Creek district on August 10, 1903, and has not been declared off, although all the mines are now operating with full forces.

Globe hill is to be worked through the Chicago and Cripple Creek tunnel by G. L. Keener. Operations on the Jo Dandy mine, at Cripple Creek, have completed additional ore house capacity and are now making a daily output of 100 tons. Manager G. D. Kilbourn of the Isabella Co. has men putting in machinery over the Empire State shaft at Cripple Creek and will start sinking the shaft another 500 feet. Bell and associates, operating on the Grace Arthur claim of the Jolly Jane Co. on Beacon hill, Cripple Creek, are driving a drift at a depth of 200 feet. A compressed air locomotive is to be put in at the El Paso Consolidated on Beacon hill, Cripple Creek, to haul cars on the third level. The shaft is almost to the 900-foot level, where laterals will be driven. The Longmont Leasing Co., in which Pullen and W. R. Foley of Cripple Creek are interested, are prospecting the bottom level, 350 feet, of the Sitting Bull on Bull hill, belonging to the Keystone M. & M. Co.

Hodges & Taubert have started work in the Ophelia tunnel to develop the Little Clara claim of the Work M. & M. Co., on Gold Hill. It is reported that Superintendent H. Starkweather of the Bayard Leasing Co., working the Trilby, Cripple Creek, has stopped development work and is cleaning up ore on hand, as the present lease expires May 1. A three weeks extension was given Harrison, Seaver & Co., lessees of the W. P. H. mine of the United Gold Mines Co., at Cripple Creek.

Austin and associates are drifting at the bottom level, 525 feet, of the Mary Alice, between the Portland and the Independence on Battle mountain. G. Wrockloff has leased a section of the Colorado Boss claim of the Cripple Creek Cons. Co., on Gold hill, and will put in an electric hoist. The Christmas shaft, on Bull hill, is to be sunk 200 feet deeper, giving a depth of 800 feet. A heavier hoisting plant will be put on by Lessee T. Vaine. It is reported that the Morning Glory Co. will sink the Aleen from the 250-foot level to the 650-foot point; and also drift at each 100-foot point.

R. L. Seaver intends sinking the 65-foot shaft of the Edith H., belonging to the Jean L. Co., on Beacon hill, to a depth of 150 feet. It is said that J. Wright, leasing the Hidden Treasure property of the Stratton Estate, will put in machinery and sink from the 400 to the 600-foot level. S. D. Crump, of Cripple Creek, has a three years lease on the Triumph on Battle mountain.

P. Penn and associates have an eighteen months lease on the Red Spruce property on Beacon hill. The new operators are required to do seventy-five shifts a month and to crosscut the property from the bottom of the shaft, which is at a depth of 375 feet. Lessees who have been working the Teutonic property on Iron-clad hill have resumed operations with two shifts on the sinking of the main shaft, which is down 305 feet will be continued to a depth of 350 feet before another station is cut.

The Work M. & M. Co.'s annual report for the year ending April, 1905, shows that the company shipped 1958 tons of ore, which gave an average value of \$34 to the ton. Of this amount the company received a total of \$12,146.48 in royalties. From Block G 150 tons were shipped and \$492.39 was the amount received as royalties. From Block D 1350 tons of ore were shipped, the company's royalties amounting to \$9959.33. From E, F and G blocks 243 tons of ore were shipped, netting the company \$821.37. From blocks H and J the royalties received amounted to \$833.39. During the twelve months 2500 feet of development work was accomplished. The lessees operating on this territory all pay 25% royalty, with the exception of those on the Little Clara claim. The gross receipts from all ore sent out by the lessees on this ground amounted to \$66,487.60. Of that amount \$36,477.47 was paid over to the lessees.

#### IDAHO.

##### Blaine County.

It is reported that the Sampson M. Co. will work in Sampson gulch, on Trail creek, 10 miles from Soldier, driving a tunnel 1200 feet to crosscut the three ledges at a depth of 600 to 1000 feet. F. R. Reed is manager. The Revis placer, on the Little Smoky, near Soldier, is being worked under direction of W. E. Pierce.

##### Boise County.

The Little Gem G. M. Co. of Pearl has put in a 25 H. P. hoist. J. C. Johnson is manager. C. E. Jackson, president of the Big Giant M. Co.'s

claims, 12 miles from Boise, says that tests will be made to determine the proper treatment for the ore, and a mill will be built.

#### Idaho County.

The Vendetta & Oro Grande M. Co. intends to build a 2½-mile flume from the south fork of Crooked river and put in a 400-ton crushing and cyanide plant at the Vendetta mine, near Oro Grande.

The Gott M. Co., near Resort, of which J. J. Toler is manager, are working Grouse Creek placers. J. W. Beckett and F. Clark of Spokane and S. Hilliard of Uniontown, Wash., have bonded a placer mine at Florence of W. Darrah, and will work it during the summer.

C. L. Hathaway, manager of the Portland & Idaho M. Co., reports that during the summer the company will operate a 50-foot Bucyrus dredge with a daily capacity of 300 cubic yards on Secesh creek, near Resort.

#### Owyhee County.

Track is to be relaid in the mill level tunnel at the De Lamar mine, at De Lamar. The upraise to connect the tunnel with the upper workings in the mines is to be made, and the ore brought to the mill through the tunnel. The gravity tramway will eventually be discarded. The Addie group on War Eagle mountain has increased its working force.

#### Shoshone County.

On Bear Top mountain, northeast of Wallace, on the north side of Pritchard creek, the Bear Top M. Co. has a mill completed, is building a flume to operate the mill by water power, and will soon be concentrating and shipping ore. The Great Western Co., at the junction of Military gulch with Canyon creek, 2 miles east of Burke, is running a crosscut tunnel to open their copper ledge.

Across Military gulch from the Great Western, the Reno group, located by T. Ryan and financed by W. R. Newport of Spokane, Wash., is being opened by a drift from a 300-foot crosscut tunnel. The company intends to start a second crosscut tunnel below the present workings. The Echo mine, between French and Hummel gulches, on Canyon creek, which has been idle for several months, has resumed work. At Mullan there are 325 men on the payroll at the Morning mine. At the Hunter there are at the mine and mill 100 men. At the upper workings of the Snowstorm 75 men are at work, and these, with the employees at the lower workings, make 100 in all. The Silver Cliff employs 6, Snowshoe 4, Gullen and San Quentin 4, Copper King 4, and the Idaho Giant 4 men. The Montana Standard M. Co. of Burke will run a 1200-foot tunnel to tap the lead. A flume is to be built to convey water for power for a new compressor to be put in.

#### Washington County.

The Ford mill at Black lake is reported to have been closed temporarily because of breakage of crusher caused by a sledge hammer in the ore.

#### MICHIGAN.

(Special Correspondence).—Work has been started on the Keweenaw Central Railway from Calumet to Lac La Belle, in Keweenaw county. F. L. Van Orden, superintendent of the Wyandot Copper Co., and W. R. Wallace are exploring with diamond drill near the Bohemian Range M. Co.'s property in Keweenaw county. Repairs to the Osceola Con. M. Co.'s stamp mill on Torch lake are progressing rapidly. At the Tamarack Co.'s stamp mill the remodeling of one simple stamp has been completed. After remaining idle for two weeks, the trammers and other underground employees at the Wolverine mine have returned to work. There were only 100 men out on strike, but they prevented 300 other employees from working. Inasmuch as the strikers at the Wolverine, Franklin, Osceola, Quincy and Franklin Junior mines were forced to return to work without their demands being granted, it is believed there will be an early settlement of the trouble at the North and South Kearsarge branches of the Osceola Con. Co. Improved results are being secured by the Isle Royale Con. Co. Rock shipments average 600 tons daily. The opening of a permanent shaft on Section 11 and exploration of the southern end of the property with the diamond drill will be pushed.

Calumet, April 22.

#### MISSOURI.

##### Jasper County.

(Special Correspondence).—The Hancock M. Co.'s new electric mill on the Murphy land, near Joplin, is enclosed and will be started soon. The Lillie M. Co., on the Amazon land at Sherwood, owned by C. M. Wilson, has contracted for a new 100-ton mill. The company has two shafts in ore. Basha, Starr & Meese of Joplin have opened up a good prospect near Four Corners. Brooks & Co., on the Panama lease in the Chitwood district, are sinking another shaft 800 feet south of the prospect and have found lead and jack at a depth of 36 feet. A company composed of Mrs. J. J. Funk of Webb City, Brogg, Brookshire & Murphy of Duenweg and J. W. Walker of Joplin has opened up a prospect on the Kirk land, 1½ mile south of Duenweg. A shaft has been sunk 76 feet. The company has put in hand jigs for cleaning the ore. The Fort Scott M. Co. is sinking a shaft on the Highball lease at Duenweg. T. N. Cheneweth of Joplin and E. J. Messall, J. H. Cline and J. H. McCue, all of Concordia, Kan., will move the Olympia No. 1 mill to Chitwood, and expect to have it running in a few weeks. They have formed the La Grande M. Co.

Joplin, April 24.

The Cold Day M. Co. has struck lead at 90 feet on the Regan land, near Joplin. The Searcher D. Co. is drilling on the Cunningham land near Myrick station, between Galena and Joplin. The Tin Button M. Co. has struck a good prospect on the Regan land. They are cribbing the shaft and preparing to run a drift. The Sexton mine, owned by the Empire M. Co., in Joplin, is sinking a new shaft to open up ore. N. P. Rood and R. Root, of Joplin, and J. Montgomery and P. H. Puckett, of Galena, owners of the Deborah M. mine in West Hollow, have put in a 10-inch lift pump.

#### Lawrence County.

A new derrick is being built at the shaft being put down on the Federal land by Superintendent G. Stratton of Aurora.



## MONTANA.

## Fergus County.

G. Bollis of Malden has sold to A. P. Morgan of New York City the Bells group, near Malden, together with the Marshall tunnel and tunnel site. It is understood that the buyer will organize a company to develop the property.

## Silver Bow County.

(Special Correspondence).—The decision of the Supreme Court awarding the Minnie Healey mine to F. A. Heinze does not alter the position of the Amalgamated C. Co. and Mr. Heinze, parties to the eight-year mining litigation in which more than 100 suits are now pending. Mr. Heinze has been in possession of the Minnie Healey and has been working it ever since the litigation over that property was begun. The case did not involve any of the numerous disputes over ore bodies, extralateral rights, or the application of mining laws. The only question involved in the Minnie Healey case was whether or not Miles Finlen, the predecessor in interest of the Amalgamated Co., agreed to sell his interest in the property to Mr. Heinze and actually placed the latter in possession of the mine before he changed his mind and sold out to the Boston & Montana Co., an Amalgamated corporation. Two district courts and the Supreme Court have found that Finlen did dispose of his interests to Heinze and had nothing left to sell to the Boston & Montana Co. The shaft of the Belmont mine, being developed by the Belmont M. Co., a United copper concern, has reached a depth of nearly 1000 feet, but no ore has yet been found, although several crosscuts have been made from various levels. The Belmont has no apex vein, but it is known that there are rich ore bodies in the ground and that some other companies, owning adjoining claims, are working on them. About 500 tons of ore a day are being mined from the Corra mine by the Corra-Rock Island Co. A new hoisting plant is being put up, the foundation for which has been completed. As soon as the new engine is put in the old one will be moved to the Lexington mine which F. A. Heinze is to explore and develop. The Butte Copper & Zinc Co., which purchased the Emma mine, has drawn plans for a concentrator to be built in South Butte for the treatment of the silver-zinc ores of the Emma. The Columbia and Emmerson gold mines in the Lowland district have been handed to John Ray of Butte for \$65,000, the bond to run for one year.

Butte, April 25.

## NEVADA.

The Nevada Legislature has passed a bill, making it unlawful for any person, company or corporation after July 1, 1905, to sink or work through any vertical shaft at a greater depth than 450 feet unless the shaft is provided with an iron-hoist safety cage, to be used in the lowering and hoisting of the employees; also any shaft less than 450 feet deep, where no safety cage is used, and where a cross head or cross heads are used, platforms for employees to ride upon while coming up or going down the shaft shall be placed above the cross heads. The provisions of the act require the placing of these platforms on the cross heads not later than July 1, 1905.

The Bullfrog Miner, of Beatty, regarding the mines of this district, says that Montgomery-Shoshone mine, M. Hoveck, superintendent, employs fourteen men; shipping rich ore. Original Bullfrog, G. Perce, superintendent, employs fourteen men; sacking good ore. National Bank, W. Smith, superintendent, employs thirteen men. Bullfrog M. Co., Ladd & Benson; J. Simpson, superintendent, employs twelve men. The Denver, O. B. Kemp, superintendent, employs four men. McCalliard & Dyer, on Denver lease, have three men sacking ore. Eclipse mine, on Denver mountain, R. Sutherland, manager, employs five men on shaft and surface work. Montana Bullfrog, on west slope of Ladd mountain, M. Walsh, superintendent, employs six men. The Yankee Girl, J. Robinson, superintendent, employs four men doing development work on flat to catch Ladd mountain ledge. Colorado Bullfrog, T. Kilker, superintendent, employs four men doing development work on flat near Ladd mountain. The Hazeltine or Gold Bar, Mr. Reinhart, superintendent, employs six men on development work. Bullfrog Extension, near Original Bullfrog, T. C. Tridel, superintendent, employs four men. The Bullfrog Annex, Montgomery Mountain M. Co., and Amethyst employ small forces. Tramps mine, on Denver hill, M. Whitelaw, superintendent, employs four men. Amargosa M. Co., Mr. Gracey, superintendent, employs four men sinking shaft on flat south of Ladd mountain; will put in gasoline hoist. Big Bullfrog, near the Original, T. McCahe, superintendent, employs four men sinking shaft. The Bullfrog Winner, near Hazeltine, J. Meighan, superintendent, employs three men. Lumber is \$130 per 1000, wood \$30 per cord, coal \$80 per ton, hay \$90 per ton, flour \$7.50 per cwt., eggs 60c per dozen, bacon 25c, ham 25c, good steak 30c per pound, potatoes 8c per pound, butter 40c per pound, sugar eight pounds for \$1, tea per pound 60c, coffee per pound 40c, meals 75c, heds \$1 per night, beer per bottle 75c, whiskey or beer per drink 15c, saddle horse per day \$4, shave 25c, hair cut 50c, freight per pound from railroad 3 to 4 cents per pound.

## Lincoln County.

O. B. Landon and A. B. Day have sold their holdings in the Searchlight M. & M. Co. to H. E. Carter and Mr. Lichtenberger. G. I. Meyers is manager at Searchlight. A 15 H. P. gasoline hoist and a roller mill are to be put in. The main shaft is to be deepened. At the Cyrus Noble cyanide plant the filtering by vacuum process has not been a success on account of the large quantity of slimes. Two settling tanks are being set up and in future the decantation process will be used. The plant is experimental and has a capacity of fifteen tons a day.

Searchlight is 10 miles east of the California line and 14 miles from the Colorado river. The companies now operating in Searchlight are: Quartette M. Co., Duplex M. Co., Good Hope M. Co., Searchlight M. & M. Co., Southern Nevada M. Co., Pompeii M. & M. Co., Boulder M. & M. Co., Saturn M. Co., Mondamon M. Co., Peerless M. Co., Enterprise M. Co., Cyrus Noble M. Co. and Santa Fe M. Co. The Quartette is operating a 20-stamp mill continuously. F. J. Harrington is superintendent.

The Duplex and Good Hope properties are operated by F. Colton and A. L. Glassell. The Searchlight M. & M. Co., of which G. Meyers is president, is taking out \$15,000 per month hullion. The Boulder M. & M. Co. is sinking entirely through the wash on the flat at the foot of the range. They have struck some very high values and at 120 feet have opened up two ore bodies. There are now in the district one 20-stamp and three 10-stamp mills, all of which are operating continuously.

Callente reports say that the Twin Pines group, south of the Virgin river, has been sold by Morris & Henley to McCulloch, Rice & Borden of Kansas City, Mo., who intend to build a mill.

## Nye County.

The Boston-Tonopah M. Co. has started work at Tonopah. J. F. McCambridge is superintendent.

In a recent report of the U. S. Geological Survey, J. E. Spurr says that the general conditions for mining and profitable production of ores at Tonopah are decidedly better than they were a year ago. The greatest advance has been in the building of a railroad to Tonopah, connecting with the Carson & Colorado Railroad at Rhodes, near Sodaville. This has lessened the cost of transportation, so that supplies have become cheaper and ores can be profitably marketed which are of lower grade than what was regarded as "shipping" ore during the period when a 60-mile haul in wagons was necessary. The roads are inadequate, however, for the needs of the district. The supply of water for the town seems to be somewhat more abundant than last year, though there is still much to be desired. Part of the supply still comes from the wells of the Crystal Water Co., 4 miles north of the town, while another portion is derived from the Rescue shaft, within the town. Until recently there have been only three principal producing mines in the Tonopah district, although a number of others have shipped small quantities of ore. These producers have been the consolidated Mizpah and Valley View mines (Tonopah M. Co.), the Montana Tonopah, near by, and the Belmont Co., whose properties are operated through the Desert Queen shaft. Recently, however, the Tonopah Extension has been discovered and developed, and from this new mine shipments of considerable amounts of ore have already been made. The success of Tonopah brought to the region an army of prospectors, who have been searching the desert for other ore deposits. The most notable result of this prospecting is seen in the new camp of Goldfield, 28 miles south of Tonopah. Already this camp equals or exceeds in population and far exceeds in activity the parent camp of Tonopah. The prediction made in Mr. Spurr's report of last year that new veins belonging to the productive period of the earlier andesite would probably be discovered underneath the later overlying lavas has been fulfilled during the past year by the discovery of several such veins. Large bodies of rhyolite dacite have also been encountered which frequently contain quartz veins. On account of the resemblance of these veins to those in the earlier andesite veins, they have been the object of a good deal of exploration and development work, whose average results have been unprofitable. The productive area has been slightly enlarged. The complicated faulting, characteristic of the district, has entailed serious hindrance to mining operations.

## White Pine County.

A. Jackson, superintendent of the Rocco-Homestake mine, near Hamilton, reports that they are sinking a winze off the shaft level to strike the lead vein. E. L. Whittle has been examining the Ne Plus Ultra mine, near Hamilton, in the interest of W. C. Rose. It is reported that J. Fairvina has struck good ore in the Julia mine on Treasure hill. A. Muir and W. Read are working the Protection mine, south of the Homestake.

## NEW MEXICO.

## Doña Ana County.

The Stephenson-Bennett Con. M. Co. of Las Cruces has resumed work on the new shaft which is to be sunk 700 feet. W. N. Crummer of Spokane, Wash., is the superintendent. The company intends to build a tramway from Organ to the El Paso smelter. N. Rose is developing the Mormon in Gold Camp. C. Anthony is opening up copper ore on the Memphis at Organ.

## Grant County.

At Santa Rita, C. P. Crawford will build a concentrating plant to treat low grade ore, the result of last year's work in Chino Canyon. The Comanche M. Co. will make improvements to its 150-ton smelter at Silver City this summer. A new 250-ton furnace has been ordered and a new 200 H. P. engine will be installed. A steel building will be built to cover the furnace plant.

## OREGON.

The Oregon Legislature has passed a bill remitting the law fixing an arbitrary license of \$10 a year on all companies owning properties that have not produced \$1000 in the preceding year. The bill providing that the date of manufacture of blasting explosives be labeled on the original package has gone into effect. Such a measure as this has never been tried in Oregon, but similar ones have been enforced by other mining States, and miners assert that they add materially to the safety of workmen underground. Mining companies may be organized in Oregon and have a board of directors resident elsewhere.

## Baker County.

Geo. Fry, manager of the Chicken Creek diggings, Weatherly, is ready for another season's run. M. Vohrer is working in Quartz and Hogback gulches, near Weatherly. M. N. Thompson, manager of the Granite mountain, near Weatherly, is crosscutting Granite mountain, and has driven 200 feet since January. F. Canaday of Warren, Ind., has arranged for the resumption of work on the Independent property adjoining the Granite mountain. W. A. Thompson, superintendent of the Indiana & Oregon G. M. & M. Co., of Covington, Ind., has received instructions through S. O. Trescott, the general manager, at Richmond, Ind., to begin work at the Gold Cliff, near Weatherly.

## Grant County.

Manager Gulgan of the Alamo group, at Alamo, is expected to commence operations on the mine. It is re-

ported work will be started on the Oro Fino group, at Alamo.

## Jackson County.

The Blue Jay mine and 10-stamp quartz mill, near Coles, has been sold to Los Angeles parties, who will operate it. Five stamps are crushing eight tons of ore daily at the Homestake mine, in Evans Creek district, near Woodville, and five more will be added to the mill. An air compressor is to be put in. F. Trowbridge has charge. Foster & Gunell of Grants Pass, operating the Oregon Belle mine, near Jacksonville, will place a 10-stamp quartz mill on the property to replace the small Huntington mill.

A \$3700 gold brick is result of a recent run at the Sturgis mine, of Forest Creek, 6 miles from Medford. The Sturgis is worked by L. A. Vanco and associates of Los Angeles. W. E. Olmstead has charge.

## Josephine County.

(Special Correspondence).—Manager J. R. Harvey is cleaning up at the Royal diggings, after the first half of the season's run. Only one giant was used. Supplies have been hauled to the Golden Eagle. Twelve miners will work during the summer months. Galice, April 24.

Superintendent L. B. Wickersham has returned to the Granite Hill mine, in Louse Creek district, near Grants Pass. Five machine drills are in the workings of the Granite Hill and one is being run in Red Jacket. The mill's ten stamps are dropping constantly.

## Lane County.

(Special Correspondence).—At Blue River, the Great Northern stamp mill has resumed. An aerial tramway will be erected this summer. The Lucky Boy 40-stamp mill will be started next month. Mr. Parks of the Treasure has ordered a 12-stamp mill. Bohemia, April 26.

C. C. Mathews, superintendent of the Oregon Securities M. Co. at Bohemia, reports that the Oregon Securities mill is dropping twenty stamps and that the full thirty will be started soon.

## Marion County.

(Special Correspondence).—In the Santiam district, there are six incorporated companies. The first mill will be built this summer. Santiam, April 25.

## SOUTH DAKOTA.

## Lawrence County.

The Imperial G. M. & M. Co. is building an addition to its tank room at its cyanide plant in Deadwood, by which it is proposed to increase the capacity to 150 tons daily. The present steam equipment is to be replaced with electric motors.

## Pennington County.

(Special Correspondence).—The Extreme M. Co., 3 miles northwest of Custer, contemplates extensive improvements the coming summer, including an addition to the mill and a cyanide plant. The ore is quartz, with mispickel and pyrite. The process is essentially one of amalgamation, concentration and cyanidation, the latter probably the bromo-cyanide process. The concentrates contain about 25% arsenic, which, as yet, they have not attempted to treat. Custer, April 20.

## UTAH.

## Plute County.

Treasurer A. A. Ball of the Annie Laurie M. Co. of the Gold Mountain district, Kimberly, reports that the new No. 5 tunnel will go into commission May 1. Manager Levy has men timbering the raise connecting with the tunnel above. As soon as the timbering is finished the new adit will be ready for use.

## Salt Lake County.

At Bingham another shift has been added at the Teck tunnel, which is in 350 feet. A flow of water has been encountered amounting to eighty gallons per minute, and at present the face is in soft ground, which necessitates timbering, but this is not expected to continue far. Manager W. C. Orem of the Utah-Apex M. Co. of Bingham has ordered a 4-drill air compressor. The adit, when completed, will be 3000 feet in length and will tap the ore bodies on the dip at a depth of 2500 feet from the surface and will open reserves 500 feet below the present lowest workings, vertical depth. The tunnel will be 7 feet high and 6 feet wide in the clear and will allow the laying of a double track. Eventually this new tunnel will be the main avenue for the exit of all ores from the mine. The upper levels will be connected with it and ore from them will be dropped into chutes, from which it will be loaded automatically in mine cars and thence taken out to the mouth of the tunnel, where it will be taken up and conveyed to the smelters over the Copper Belt tracks.

Manager W. G. Craig of the Kennebec mines, Alta, has decided to drive an intermediate tunnel 400 feet long midway between the upper and lower one. With this he will connect with the lode at a station 50 feet below the old stopes. An electric generator is to be put in and run with water from the tunnel.

## Utah County.

The Signet M. Co., in American Fork canyon, has resumed operations. It is reported that the Hot Stuff, owned and operated by the Goodsell M. Co., will be started. C. D. Hanks of American Fork is working the Wish Bone mine, near the Dutchman mine; the Geneva and May Blossom, near the Silver lake at the head of Deer creek; the Boley mine, on Millar hill, and the old Waterfall, in the head of the canyon.

Woodward Bros., who are working the Buckley mine in Rock canyon, near Provo, on a lease, have shipped two carloads to the smelter at Murray. This will be the first ore shipped from the Provo district.

## WASHINGTON.

## Ferry County.

C. E. Hoffman, manager of the Globe G. & C. M. Co., has resumed work on the company's property on Toulou mountain, 3 miles southeast of Orient. The tunnel, which is now in 136 feet, will be driven ahead to tap the ledge.



## FOREIGN.

## AFRICA.

Success is attending the prospecting of the Lower Witwatersrand reefs, near Roodpoort, and near Rhenosterspruit in the Klerksdorp district. There is marked activity in connection with the older reefs, especially in the Heidelberg district and in the Western Rand, and the experience gained in a good many instances seems to show that the reefs improve in depth. Their gold contents are not as consistent as those of the Main Reef series—the country is more broken and irregular, and mining may be expected to be somewhat costly—but with all the Main Reef ground taken up at a reasonable depth capitalists are finding it advisable to bestow some attention on these lower series of reefs, now proved to extend over many miles north of the outcropping Main Reef series. Columbus country, between Johannesburg and Pretoria, has been shown to possess these lower reefs, but their value proved so far seems to be too low to admit of successful working.

Two thousand Chinamen employed at the North Randfontein mine, near Krugersdorp, recently struck, expressing dissatisfaction with their wages. The trouble was caused by their refusing to drill more than 12 inches per day, and then stopping work until they came to the surface. Other coolies who drilled more were intimidated and ill treated by members of a Chinese secret society. The Chinese have now resumed work and are drilling satisfactorily. They have informed the gangers that they now intend drilling 3 feet.

## CANADA.

## BRITISH COLUMBIA.

## Boundary District.

Boundary ore shipments for week ending April 22 were as follows, each district smelter having some furnaces out of commission for repairs. Granby mines to Granby smelter, 9850 tons; Mother Lode to British Columbia copper smelter, 3500 tons; Brooklyn to Montreal & Boston smelter, 315 tons; Rawhide to Montreal & Boston smelter, 180 tons; Mountain Rose to British Columbia copper smelter, 231 tons; Dominion C. Co.'s Stemwinder dump to Trail smelter, 70 tons; Oro Denoro to Granby smelter, 70 tons. Total for week, 17,051 tons. Total for year, 284,164 tons. The treatment by the Boundary smelters for the past week was as follows: Granby smelter, 12,018 tons; British Columbia copper smelter, 3818 tons; Montreal & Boston smelter, 3350 tons. Total for week, 19,166 tons. Total for year to date, 290,807 tons.

At Skylark the Tip Top has been bonded for W. S. Macy of Phoenix by R. Stuart and J. C. Haas of Greenwood.

## Nelson District.

It is announced from Nelson that the amalgamation of the LeRoi, War Eagle, Center Star and Snow Shoe mines and Trail smelters has been completed. The new company has a capitalization of \$10,500,000.

## Rossland District.

It is reported that the Cliff mine near Rossland is to be started under the direction of C. E. Simpson.—The shipments for the week ending April 22 were: Le Roi, 2525 tons; Center Star, 2080 tons; War Eagle, 1170 tons; Le Roi No. 2, 150 tons; Jumbo, 200 tons; Spitsee, 270 tons. Total for week, 6395 tons, and for the year, 108,952 tons.

## Slocan District.

B. P. Little, lessee of the Payne concentrator, is turning out some high-grade zinc and almost pure iron ore from the magnetic separator.—G. F. Ranson, manager of the Payne, will start up to the Sovereign mine.

## Vancouver Island.

The British Columbia Mining Record says the great coal measures of Vancouver Island extend from Ladysmith north to Union, 75 miles. The Extension mines, 11 miles from Ladysmith, from which high grade coal for domestic purposes on the Pacific coast is shipped, are known by borings and prospecting to extend nearly to Ladysmith. The coal shipped from the island to date amounts to 19,940,587 tons, with a value of \$60,203,285, and the coke to 149,556 tons, with a value of \$947,780; a total of \$61,151,065. On the west coast of the island, beginning at East Sooke, mineral has been found and small shipments made from San Juan, Port Renfrew, Alhemi, Uchucklesit, Clayoquot, Kennedy Lake, Taferno Inlet (Deer Creek), Bedwell Sound (Bear River), Trout River, Clayoquot Sound, Sidney Inlet, Ahousat, Ahat-lasett, Nootka, Kyuquot and Quatsino, while in the middle of the island at Central Lake a large deposit of mineral has recently been discovered. The schist beds lying to the south of the coal measures, known as the Mt. Sicker schist belt, extend from Mt. Sicker up to the Nanaimo lakes. These have been opened and worked along 40 miles at Mt. Sicker, Mt. Brenton, Chemainus, Majuba, Rhinehardt, Nanaimo lakes and Englishman's river. Owing to the fact that the land is heavily timbered, prospecting is slow and expensive. The total quantity and value of the metallic mineral product to date of Vancouver Island and vicinity is given by the Provincial Mineralogist, W. F. Robertson, as 275,322 tons, of a value of \$4,378,370.

## Yale District.

Greenwood reports says F. L. Underwood of New York, president of the British Columbia Copper Co., and W. H. Thomas, consulting engineer, are on a trip through the Kettle river and the Similkameen districts, accompanied by W. N. Merrill and J. Killer Schon of Duluth, to find the facts of the proposed smelter at Midway and the probable tonnage which could be secured from these localities.

## MEXICO.

Mining men of Mexico are interested in the situation which has resulted from the destruction of part of the plant of the National Dynamite & Explosives Co. in the State of Durango. This company was recently given a monopoly of the Mexican field by the government placing in effect a high tariff on the importation and consumption of foreign dynamite. The explosions wrecked the mixing departments of the plant, completely shutting off the output and making it a matter of months

before dynamite can be again manufactured. The company claims to have on hand supplies sufficient for the Mexican demand for three months, but it will be impossible to repair the damage and install new machinery within that period. It is evident that foreign dynamite will have to be imported, and the concessions held by the company gives it the right to bring in dynamite from abroad at one-seventh of the prevailing tariff. French dynamite companies are principally interested in the Mexican company, and any importations made by that concern will be undoubtedly made from France.

## Durango.

It is reported that the American-Mexico M. & Dev. Co. has blown in its lead smelter at its property near San Lorenzo. The company's pyritic plant was blown in the last of March and is now in successful operation. The capacity of the latter is 60 tons, and that of the former 100 tons, with arrangements for increasing to 500 tons.

## Sonora.

(Special Correspondence).—At the Hidalgo mine at Nacozari men are sinking a shaft and running a tunnel. This property is owned by the Hidalgo M. Co. and is being worked under bond by A. Adamson.

Nacozari, April 24.

(Special Correspondence).—The Calumet & Sonora M. Co., which owns the San Antonio, San Juan and Buena Vista mines, 5 miles south of Cananea, has purchased \$60,000 worth of machinery. Superintendent A. C. Daugherty states that development work will be pushed rapidly.—J. B. Tomlinson, general manager of the Swansea mine, near Cananea, says that his company is putting in additional machinery as rapidly as weather will permit. A new vein of malachite ore running high grade copper and silver has been found.—F. L. Proctor, G. McMillan and D. McMillan have sold the Dos Naciones mines, adjoining the Cobre Grande mine near Cananea, to Duluth, Minn., parties.—J. W. Hardy has sold his copper property, 6 miles from Cananea, to Northern capitalists, who will begin active operations at once.—P. E. Murray, superintendent of the Lindsay Cananea Central M. Co., reports good progress.

Cananea, April 24.

The Sandoval concession of the Boludo gold placer mines, 2½ miles northwest of El Tiro, in Altar district, has been taken over by L. Lindsay of Los Angeles, Cal. Crushers and rolls are to be put in and water is to be brought to the ground.

## SOUTH AMERICA.

## Bolivia.

W. Hooker, in the Mining Journal, says that, in addition to gold, silver, copper and tin, bismuth, mercury, platinum, lead, iron, zinc, nickel, aluminum and sulphur are found in Bolivia. Coal has also been discovered near Lake Titicaca. Most of the metalliferous deposits exist on the eastern slopes of the Andes, at considerable heights above sea level, and their nature of occurrence generally renders it most convenient to work them by adit. But, notwithstanding that mining is traditional throughout the country, practice is crude to a degree and what is even a greater drawback—the country is so entirely without means of communication that each district is practically self-dependent, and economical co-operation between the agricultural and mining communities is impossible. On the southwest a highly mountainous tract, commencing with the district of Potosi, which adjoins the Chilean boundary, terminates northward 120 miles beyond La Paz. The only railway runs in from Antofagasta, through Uyuni, and terminates at Oruro. It enables the nitrate and borax deposits to be worked cheaply and serves one or two mines. The Huanchaca mines built their own branch line on to the main track. The Colquechaca mine, five days' march from the railroad, has a plant including two Cornish pumps and two tubular boilers. Hoisting is done with a steam capstan. The heavier machinery was taken up in parts over a specially constructed cart track, but most of the material goes up on the backs of mules. Their old reduction works was 10 miles down the valley at La Palca, and the ore was carried down by llamas and mules. Now they have a reduction plant close to the mine, and the concentrates are frequently sent down to the coast for shipment. The works at La Palca have been taken over by an American firm, who work a lixiviation plant, purchasing the ores from the different mines. At Colquechaca there would be sufficient water power for a proper electrical installation by water wheel. At the present time they are pumping up hundreds of gallons of water per hour, while there are two small streams running on each side of the property. There are at present some twenty-four tin mines in operation, all worked in a very crude manner, besides innumerable stream workings. The ore, which is cassiterite, is picked, crushed, concentrated and shipped. Hand picking is done on a large scale and frequently the stone is practically pure tin. A mine in Llallagua, belonging to Don Pastor Sainz, is on the slope of a mountain, 4700 meters above the sea level. The vein is close to the face of the mountain, and to reach it they drive in adits. The concentrated ore goes 62% tin, and the loss in tailings is from 10% to 12%. Between Colquechaca and Sucre there is much tin washing done in the rivers and large quantities of tin are produced.

## Obituary.

RICHARD MURLEY, an old-time miner of Gilpin county, Colo., died at Edgewater, near Denver, April 21, of miner's consumption.

J. E. KEARNS, one of the pioneers of Kawich, Nev., and owner of fifty-four claims in that district, died April 17 in Kawich of pneumonia.

W. G. TIFFANY died April 23 in New York City. Tiffany was 63 years old. Most of his business life was spent in the West and Southwest, where he was engaged in many mining ventures.

## Personal.

F. E. WADE is manager Glohe M. Co. of Deadwood, S. D.

D. C. TOBIN is superintendent Continental mines at Vulcan, Colo.

J. M. BURKE has returned to Spokane, Wash., from a visit to Utah.

P. BEARDSLEY of Chicago, Ill., is mining at Tanticaro, Michoacan, Mexico.

JOHN GRAY, manager Wasp No. 2 M. Co., has returned to Deadwood, S. D.

J. H. EMERY, manager Gold Coin M. Co., has returned to Idaho City, Idaho.

L. LANE is superintendent Victor & Virgin mine, near Vivian, Mohave county, Ariz.

G. A. WRIGHT will take the management Totok mines, Celebes, Dutch East India.

J. D. SPARGO has resigned as superintendent Gold Road M. Co., near Vivian, Ariz.

A. M. ROCKWELL has resigned as superintendent White G. M. Co. at Tucson, Ariz.

W. J. KEOUGH has been appointed superintendent Minerva M. Co. at Atlanta, Idaho.

J. E. NIHILL, superintendent Mayflower mine, Forest Hill, Cal., has been in San Francisco.

F. H. NETTLETON of Spokane, Wash., has been examining mines in Mohave county, Ariz.

E. E. RODGERS, president Black Pearl M. Co., has returned to Pearl, Idaho, from Chicago, Ill.

E. F. SPARROW has succeeded E. I. Leach as superintendent Gold Treasure M. Co. at Naco, Ariz.

M. J. MAHER, president Montana Standard M. Co., has left Burke, Idaho, for a short Eastern trip.

T. G. DAVEY, consulting engineer to the Northern Copper Co., has returned to Rhodesia from London.

T. MANION of Ouray, Colo., has been appointed superintendent Flying Dutchman M. Co. at Eureka, Utah.

L. W. TRUMBULL has taken position as consulting engineer with Strong Copper M. Co. of Leslie, Wyo.

J. C. BARROWS of Centerville, Iowa, is manager Mountain Monarch M. Co. at Rollinsville, Gilpin county, Colo.

E. GUARINI of Brussels, Belgium, has been appointed to a professorship in the school of engineering at Lima, Peru.

W. A. HOLT AND A. C. SEIBOTH of Globe, Ariz., are at Superior, Mich., inspecting the Lake Superior & Arizona mine.

C. GREEN, president Idaho Placer M. Co., near Olds Ferry, Washington county, Idaho, has returned from a trip East.

M. BROWNING, formerly superintendent Enterprise mine at Slocan, B.C., is now superintendent Rustler M. Co., Libby, Mont.

E. F. GORDON, general manager Hillside M. & M. Co., has been at the company's mines at Big Creek and Orgrande, Idaho.

T. E. LUDLAM of Sea Isle, N. J., president Union Pass G. M. Co., has been examining the company's mines near Kingman, Ariz.

F. W. HOAR, of El Paso, Texas, has succeeded J. H. Knowles as superintendent Chiricahua Development Co., at Paradise, Arizona.

M. BOUERY will be retained as manager La Grange mine on Oregon Gulch mountain, 6 miles west of Weaverville, Trinity county, Cal.

C. W. WILLIAMS has been appointed superintendent Mountain Iron and Stevens mines of the Oliver M. Co. at Mountain Iron, Duluth, Mich.

P. T. BAIRD has resigned as superintendent Hidden Treasure G. M. Co., at Lead City, S. D., to take the superintendency of Big Four M. Co., at Lead City.

A. E. DRUCKER, E. M., has taken a position with the Oriental M. Co. in Korea, as superintendent of their cyanide department, and leaves San Francisco, Cal., for his field of duty May 12.

## Books Received.

"Proceedings of the American Institute of Electrical Engineers," 95 Liberty street, New York City.

"Underground Waters of Eastern United States," by M. L. Fuller, Bulletin 114 of "Water Supply and Irrigation Papers" of the United States Geological Survey.

"Martin's Mining Cases of British Columbia," Vol. II, Part I, has been issued from the press. The rapid development of the mineral resources of British Columbia the past few years has resulted in a largely increased population in that province, and incidentally a great deal of mining litigation, and court decisions on the legislative acts of the Dominion Parliament. The author has collected the numerous reports and decisions which heretofore have been scattered through numerous volumes of legal matter, and has embodied these in compact volumes, and including numerous unreported cases, so that these books, Vol. I and Vol. II, now form the beginning of a series of statutes and valuable decisions on the mining law of British Columbia. These volumes bring the subject down to Jan. 1, 1905. It is the intention to issue these "Mining Cases" regularly, and they cannot fail to be of great value to practicing attorneys and to mine managers in that province. A notable feature of these cases is the head and foot notes prepared by the author, Mr. Justice Martin. These are written with unmistakable completeness and clearness. All who in any way come in contact with mining legislation in



British Columbia will find "Martin's Mining Cases" of great value. The book is published by The Carswell Co., Ltd., Toronto, Ontario, Canada, for \$5, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Trade Treatises.

The Foss Gas Engine Co., Springfield, Ohio, catalogue portrays a portable engine with steel truck.

The No. 15 Keller assay balance is finely portrayed in a series of slips sent out by the manufacturers, the Salt Lake Hardware Co., Salt Lake City, Utah.

A 138-page catalogue from the Rawson & Morrison Mfg. Co., 31 Main St., Cambridgeport, Mass., describes their bolting and automatic coal handling machinery.

"Crushing Rolls" for wet or dry crushing is the title of a handsome 12-page pamphlet illustrating and describing the crushing rolls manufactured by the Fulton Iron Works, San Francisco, Cal.

The second edition of Catalogue No. 6-B, "Stamp Milling Machinery," from the Colorado Iron Works Co., Denver, Colo., has considerable illustrated description of modern appliances in stamp milling and ore reduction plants of manifest interest.

The most pretentious publication of the kind received this week is the 250-page quarto, substantially bound, entitled "Stirling: a Book on Steam for Engineers," and which goes into the entire subject in all its details in an elaborate manner. There are several formulae of technical value and the work is worth examination by any one having to do in any capacity with the operation of a steam boiler. It is from the Stirling Boiler Co., Pullman Bldg., Chicago, Ill.

## Commercial Paragraphs.

THE S. H. Supply Co. of Denver, Colo., are furnishing a 15-drill compressor plant for shipment to Mexico, a 5-stamp mill to Hailey, Idaho, and a 10-stamp mill to California.

THE Fulton Iron Works, San Francisco, Cal., have closed a contract with the Sierra Buttes mines, Cal., W. D. Pinkston, superintendent, for furnishing them a complete 40-stamp mill to be driven by water power, and a complete cyanide plant having twelve 30-foot diameter by 6-foot deep leaching tanks with all accessories for both mill and cyanide plant.

THE Brown Corliss Engine Co. of Corliss, Wis., have an order from the National Tube Co. to furnish the McKeesport plant with two 38-inch & 70x60-inch tandem compound rolling mill engines for special heavy work. They have shipped a 32-inch & 60x48-inch combined vertical and horizontal condensing engine for the Illinois Steel Co. Joliet plant.

THE Compressed Air Machinery Co. of San Francisco, manufacturers of the Word Bros.' drill maker and sharpener, have shipped three machines to the Oliver Iron Mining Co., Duluth, Minn.; one to the Cleveland Cliffs Iron Co., Ishpeming, Mich.; one to the Gold King Mines Co., Silverton, Colo., and one to the Yak Mining, Milling & Tunnel Co., Leadville, Colo.

THE Cyclone Drilling Machine Co. of Orrville, Ohio, reports that the Economy blast hole loaders, formerly manufactured by Cope & Cornelius, are now manufactured by them, and that orders for loaders are coming in rapidly from the United States, Mexico and Canada. They also report having many orders for Cyclone contractors drills and coal and water well machines.

J. W. DUNTLEY, president Chicago Pneumatic Tool Co., sailed on the 18th inst. on the Kaiser Wilhelm II for a five weeks' trip to Europe in the interest of the pneumatic tool business, taking with him five styles and sizes of electric drills. Tests and orders await Mr. Duntley's arrival for the purpose of having him demonstrate these tools before the orders are placed elsewhere, as was contemplated previous to the announcement of his expected trip, and he has reason to believe he will secure the business.

STEPHENSON BAR BELT DRESSING is for use where a belt transmits power. Put up in stick or solid form, it can be carried in the tool box. There is no waste, as friction effects an even distribution. Stephenson dressing is carried in stock by the Mine & Smelter Supply Co., Denver, Colo., Alex. Helms Belting Co., L. P. Degen Belting Co. and E. C. Atkins & Co., San Francisco, Cal., and by the latter concern at Portland and Seattle. The Stephenson Mfg. Co. at Albany, N. Y., will send, postage prepaid, a free sample of their Red Label brand for leather belts, or Green Label brand for rubber or canvas belts, to any address in the world.

THE A. S. Cameron Steam Pump Works of New York City write that they have transferred their agencies to and are now represented by Cary & Fielding, 1711 Tremont street, Denver, Colo.; Utah Mining, Machinery & Supply Co., 228 South West Temple street, Salt Lake, Utah; Ingersoll-Sergeant Drill Co., El Paso, Texas; Victor M. Braschi & Co., Cadonast street, No. 2, Mexico City, Mexico. These firms will carry a full line of the Cameron pumps and repair parts in stock, and doubtless will be able to fill all orders on shortest notice. In addition to the stock transferred, three carloads of pumps and parts have been received by Cary & Fielding and a carload each by the Utah Mining, Machinery & Supply Co., the Ingersoll-Sergeant Drill Co. and Messrs. Victor M. Braschi & Co., so that they are all equipped and ready for business.

## Latest Market Reports.

SAN FRANCISCO, April 28, 1905.

### METALS

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 57c, refined (1000 fine); San Francisco, 57c; Mexican dollars, 46c, San Francisco; 44½c, New York.

The customs value of the Mexican dollar on goods invoiced from Mexico on and after May 1st will be 49.8 cents, this being the gold standard value in Mexico.

On all goods from other countries invoiced in Mexican dollars the value of the latter will be computed at 47.7 cents, the bullion value of the Mexican dollar.

This is in accordance with a circular of instructions from Secretary Shaw.

COPPER.—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15@15.25; Electrolytic, 1 to 3 casks, \$15.75; Casting, 1 to 3 casks, \$15.00. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £66 5s spot per ton.

LEAD.—New York, \$4.50; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 6s per long ton.

SPELTZ.—New York, \$6.00; St. Louis, \$6.15; London, £24 per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.20@30.50; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 35@37½c. London, £139.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$40.00@41.00, large lots; London, £7 12s 6d; San Francisco, local, \$38.00 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

ZINC.—Metallic, chemically pure, 50c; dust, 40c; sulphate, 30c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, ½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, ½c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00@shingles, \$2.50 for No. 1 and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. h. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%—99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.10; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot,

\$2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, boiled, bbl., 60c; cs., 65c; raw, bbl., 58c; cs., 63c; Lucol oil, boiled, bbl., 51c; cs., 56c; raw, bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As; tral, 19c; Star, 19c; Extra Star, 22c; Ecocene, 21c; Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal Iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c; do., cs., 22½c; 8½c Gasoline, bulk, 25c; do., cs., 31c; 8½c Naptha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, 80c.

PHOSPHORUS.—American, 70c.

SODIUM.—Metal, 50c.

BISMUTH.—Subnitrate, 80c.

URANIUM.—Oxide, 80c.

MERCURY.—Bichloride, 75c.

TUNGSTEN.—Best, 125c.

SILVER.—Chloride, 90c per oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, 7c; less than 500 lbs., 7½c.

MANGANESE.—Black oxide, 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING APRIL 18, 1905.

787,654.—LUBRICATOR—C. H. Almond, Seattle, Wash.  
787,713.—TRACE FASTENER—C. R. Austin, Lind, Wash.  
787,432.—FURNACE—Brett & Benton, Los Angeles, Cal.  
787,696.—SHOVEL—M. Cahill, San Francisco.  
787,532.—CARP HOLDER—M. E. & W. O. Carley, Colfax, Wash.  
787,662.—RIBBON PAPER FEEDER—E. D. Castorline, San Francisco.  
787,568.—AERIAL CABLEWAY—F. R. French, San Francisco.  
787,621.—SUCKER ROD—E. R. Graham, Bakersfield, Cal.  
787,515.—TOY—L. H. Hunter, San Francisco.  
787,450.—MATTRESS—Eva K. Jacobs, Everett, Wash.  
787,516.—GAME—P. W. Jannoch, Pasadena, Cal.  
787,452.—CARP HOLDER—L. Johnson, Seattle, Wash.  
787,531.—ROTARY ENGINE—P. Magee, Los Angeles, Cal.  
787,783.—GLASS BEVELING MACHINE—J. H. McBride, Lompoc, Cal.  
787,388.—CARPET CLEANER—A. E. Moorhead, Oakland, Cal.  
787,884.—CARPET CLEANER—A. E. Moorhead, Oakland, Cal.  
787,461.—SHOW CASE—C. F. Murray, Los Angeles, Cal.  
787,635.—OIL BURNER—A. Phinney, San Francisco.  
787,799.—GLOBE SUPPORT—L. L. Smith, San Francisco.  
787,787.—SPRING LAUNCHER—E. T. Turner, Sacramento, Cal.  
787,811.—CURRENT WHEEL—P. M. Warren, Nyssa, Or.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

GAS LIGHTING DEVICE.—No. 786,928. April 11, 1905. A. F. Williams, Berkeley, Cal. The object of this invention is to provide a means for holding matches, tapers or like lighters so that they may be extended to ignite gas from burners or apparatus which is otherwise beyond the reach of an ordinary person. The device consists of a long handle having ferrules at the ends and an intermediate portion provided with an adherent friction strip spirally wound thereon, whereby its edges meet to form a substantially smooth and flush surface, and a match holder fixed to the end of the handle and extending in the direction of the length thereof, said holder composed of spring wire bent upon itself to form two members, one standing parallel with the other, one of said members being also bent upon itself to form a third portion which extends substantially parallel with the other members and beyond the first named bend and is fitted to the ferrule end of the handle, and other details of construction adapted to bring about a new and useful result.

ADJUSTOR FOR DEEP WELL SUCKER RODS.—No. 787,621. April 18, 1905. Edwin R. Graham, Santa Barbara, Cal. The object of this invention is to provide a convenient and practical means for adjusting pump valves without the necessity of uncoupling the sucker rods from the walking beam and then having to pull up or lower the rods by a cumbersome mechanism of rope and tackle. In oil and other deep wells it is necessary from time to time to effect a readjustment of the pump valves according to the nature of the well and other causes. Various types of adjusters are in use, but they generally employ a form of friction grip on the exposed part of the sucker rod, and trouble from slippage is of frequent occurrence, since the sucker rod may be several hundred feet in length and very heavy. It consists in the combination of a walking beam, a sucker rod, a pump rod, and the pump valves of the well, and a lower valve of the well unit connected to the sucker rod, a threaded rod connected to the union, and a yoke from which the threaded rod is suspended, said yoke consisting of a single piece of metal folded upon itself and with its light spread or open to receive and embrace the end of the walking beam, and having its side arms converging downwardly, and opposing clamp members on said arms and adapted to clamp the threaded rod, said yoke and clamp members consisting of a unitary structure.

SHOVEL OR SPADE.—No. 787,660. April 18, 1905. Michael Cahill, San Francisco, Cal. The object of this invention is to provide a serviceable, practical implement of this character especially suitable for operating in heavy mud, such as "adobe," or in plastic soils where it is often difficult to detach the soil and load from the soil and to unload the soil. The invention encompasses the peculiar perforations of the blade of the shovel or spade to prevent the dirt sticking to the blade and providing a removable attachment for the top of the blade which will afford a broad resilient support for the foot in pressing the implement into the ground and which will protect the foot from injury in case it slips off the blade. It consists of a pressure plate for spades and shovels, having means of attachment with the blade thereof and a roller disposed at the end of and transverse to the plate.

AERIAL CABLEWAYS.—No. 787,569. April 18, 1905. Frederick R. French, San Francisco, Cal. This invention relates to apparatus for the movement of a burden or burden carrier in either a horizontal or a vertical direction by means of cables suspended between two supports and adapted automatically to dump a burden in midair from the containing burden carrier at the will of the operator. The object of this invention is to provide a suitable support for the fall lines and a safe method of dumping in midair. It consists in a hoisting and conveying apparatus, the combination with an overhead trackway and a carriage thereon, of two fall line sections supported from the carriage, a block carried by each section, a flexible connection between said blocks, a burden carrier on said flexible connection, and means operatively for the movement of one block relative to the other to effect the dump.



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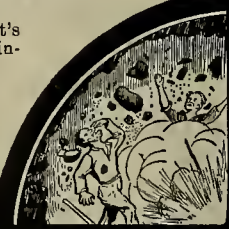
Many a father could be saved to his family if he could receive prompt aid from experienced hands. If a premature explosion should occur, and men torn and disabled, the foreman could immediately send a hurry call for the ambulance, and by the time the hoist had raised its half-alive burdens to the surface, experienced hands could begin at once to keep them alive.

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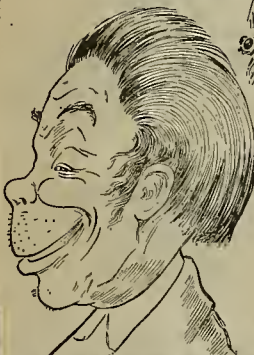
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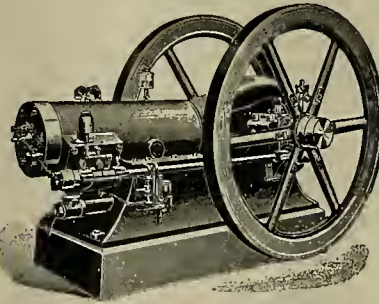


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## DELINQUENT SALE NOTICE.

**GOLDEN WEST MINING COMPANY.**—Location of principal place of business, San Francisco, California; location of works, Tuolumne County, California.

Notice—There are delinquent upon the following described stock on account of assessment (No. 4) levied on the 11th day of March, 1905, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	Shares.	Am't.
Geo. F. Buck .....	31	2000	\$20 00
F. O. Gardiner.....	60	625	6 25
J. J. Kelly.....	70	100	1 00
Catherine Kelly.....	71	100	1 00
S. E. Hughes.....	72	100	1 00
Mrs. Ellen Kuhns.....	82	1200	12 00
E. Gentili.....	83	500	5 00
Geo. Chas. Berg.....	100	1000	10 00
Geo. Marks.....	101	250	2 50
R. V. Hanks.....	117	100	1 00

And in accordance with law and an order from the Board of Directors, made on the 11th day of March, 1905, so many shares of each parcel of such stock as may be necessary, will be sold at public auction at the office of the company, 207 Battery street, Room 15, San Francisco, California, on SATURDAY, the 13th day of May, 1905, at the hour of 2 o'clock P. M. of said day, to pay said delinquent assessment thereon, together with costs of advertising and expenses of sale.

CHAS. BOVONE, Secretary.

Office—207 Battery street, Room 15, San Francisco, California.

## DELINQUENT SALE NOTICE.

**ALTA SIERRA GOLD MINING COMPANY.**—Location of principal place of business, Room 620, Kohi (formerly Hayward) Building, 406 Montgomery street, San Francisco, California; location of works, Sierra County, California.

Notice—There are delinquent upon the following described stock on account of assessment of thirty (30) cents per share, levied on January 28th, 1905, the several amounts set opposite the names of the respective shareholders, as follows:

Names.	No. Cert.	Shares.	Am't.
H. A. Keller.....	42	2809	\$ 842 70
M. H. Mead.....	27	100	150 00
M. H. Mead.....	28	500	150 00
M. H. Mead.....	29	556	166 80
Wm. H. Mead.....	48	6000	1800 00
Thomas C. Pedlar.....	3	5	1 50

And in accordance with law and an order from the Board of Directors, made on the 26th day of April, 1905, so many shares of each parcel of such stock as may be necessary, will be sold at the office of the company, Room 620, Kohi (formerly Hayward) Building, 406 Montgomery street, San Francisco, California, on WEDNESDAY, May 17th, 1905, at 12 o'clock M. of said day, to pay the delinquent assessment thereon, together with costs of advertising and expenses of sale.

SAM. W. CHEYNEY, Secretary.

Office—Room 620, Kohi (formerly Hayward) Building, 406 Montgomery street, San Francisco, California.

**THE CALIFORNIA DEBRIS COMMISSION** having received application to mine by hydraulic process from E. H. Wakeman, N. H. Lang and J. B. Cronan, in Alturas and Ramona Mine, near Cromberg, Plumas County, Cal., draining into tributary of Long Valley Creek which reaches Middle Fork of Feather River, gives notice that a meeting to receive any protests will be held at Room 68, Flood Building, San Francisco, Cal., May 1, 1905, at 1:30 P. M.



# MINING AND SCIENTIFIC PRESS

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SAN FRANCISCO, CAL., SATURDAY, MAY 6, 1905.

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Fig. 1.—Folsom Development Co.'s Dredger No. 1.

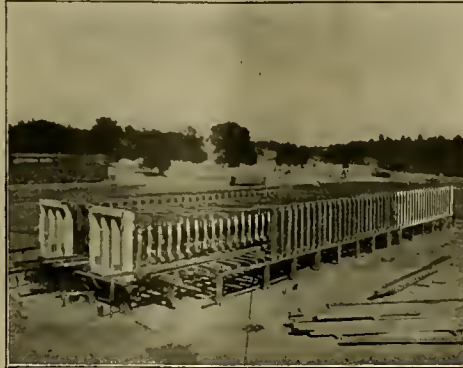


Fig. 2.—Framework in Pit.

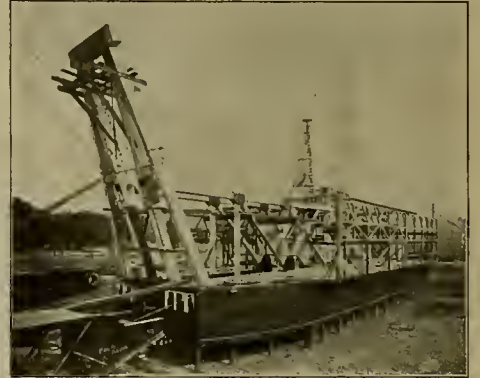


Fig. 3.—Framework in Pit, Gantries Up.



Fig. 4.—Hull Floated.



Fig. 6.—Ladder Frames and Rollers.



Fig. 7.—Tailings-Stacker Drive.



Fig. 8.—Stacker Without Belt.

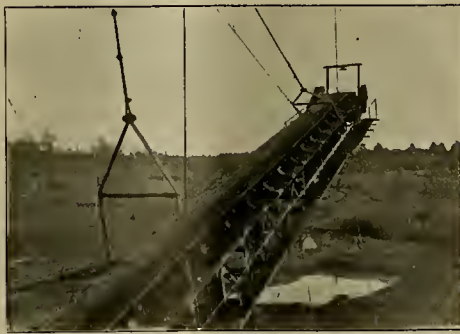


Fig. 9.—Stacker With Belt.



Fig. 10.—Digging End in Operation.



Fig. 11.—Buckets and Pilot House.

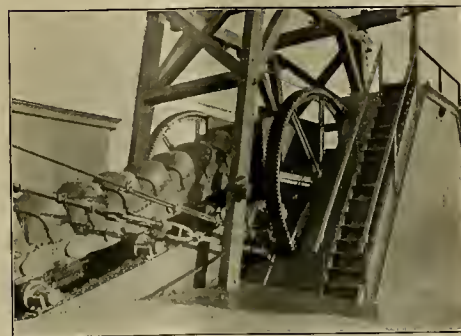


Fig. 12.—Main Drive.

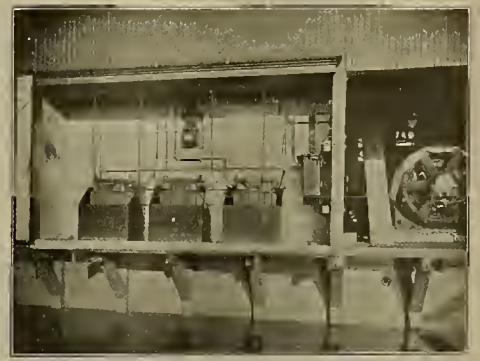


Fig. 13.—Transformer House.

Views Showing Construction and Operation of a Modern Gold Dredger.

(See Page 282.)



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THE disastrous explosion which recently wrecked the Mexican dynamite factory was probably anticipated by most Americans who were familiar with conditions there, but the disaster was delayed somewhat longer than had been expected. The making of nitro explosives is always attended with extreme danger, for there are certain peculiarities of the fickle compound which are not understood by those who make it, or deal in it, or who are thoroughly familiar with the chemistry of the process. One mystery which baffles all attempts at solution is why there is an interval of some seconds' duration between explosions at the time of the destruction of powder works. This is a phenomenon which has been frequently noted and commented upon, but as yet without satisfactory explanation. In one instance in California there was an interval of fully ten seconds between the explosion of the mixing house and that of the magazine, 600 feet distant. These two structures were connected in no way by pipe, flume, wire or otherwise. On this occasion there were a series of explosions, great and small, lasting over a period of twenty seconds or more.

THE recent decision of the Supreme Court of Montana, in giving to F. A. Heinze the Minnie Healey mine at Butte, is important in that it establishes the validity of a verbal agreement to transfer mining property. Miles Finlan, formerly owner of the Minnie Healey mine, expended something over \$50,000 in its equipment and development. It is claimed that he offered the property to Heinze for about what he had expended upon it, which offer, upon examination, Mr. Heinze accepted. Mr. Finlan left at once for the East, and Heinze took possession of the mine and began a crosscut into the hanging wall. Owing to the sudden departure of Mr. Finlan, no papers were drawn up nor was official record of the transaction made. A few days later the miners employed by Heinze ran into a body of rich copper ore, and the story is that upon learning of this Mr. Finlan attempted to repudiate the transaction and claimed the property.

## Important Mining Decision.

The mining law, or, rather, its interpretation, is constantly undergoing changes by reason of the decisions of the higher courts. One of the most important of these recent phases of judicial legislation is the decision of the United States Supreme Court in the case of the Creede & Cripple Creek Mining & Milling Co. v. the Uinta Tunnel Mining & Transportation Co. In this case the former company owned a mine in the Cripple Creek district of Colorado and had applied for and received a United States patent for their claim. The latter company is the owner of a tunnel right, located prior to the issue of patent to plaintiff, and had driven a tunnel several hundred feet to the line of the former company's property, through their claim and beyond to veins not apexing at the surface (not an uncommon occurrence in the Cripple Creek district of Colorado). The Cripple Creek Company then sought to restrain the tunnel company from passing through the property owned by plaintiff, by means of the tunnel, the action being also for the possession of certain mining claims and for damages. On motion of defendant the action was removed to the United States Circuit Court for the district of Colorado, where also, on its motion, the pleadings were reformed and the action made one for the possession of the property and for damages. The plaintiff, in an amended complaint, alleged ownership of certain lode claims for which it had obtained patent without adverse from the tunnel company, and claimed that the patent related back and took effect of the date of alleged discovery of the vein, for all purposes given and provided by the laws of the United States and the State of Colorado concerning mining claims. One of the important matters decided was the relative rights of the owners of unpatented and patented claims. Without here going into details of the several contentions of the parties to this suit, it may be stated, for brevity, that the Circuit Court of Appeals reversed the decision of the lower court and decided for the defendant, the tunnel company. The Supreme Court of the United States, being called upon to review the judgment of the Circuit Court of Appeals, the higher court rendered a decision which can not fail to be far reaching in its effect and to entirely change the aspect of the rights of tunnel and other claimants to pass through the country rock under the unpatented surface of their neighbors, in order to reach unknown veins and deposits lying beyond. Heretofore this right had been uniformly denied, but the opinion of the Supreme Court, written by Mr. Justice Brewer, now, under certain conditions, permits this privilege. In the original opinion, handed down January 30, 1905, the court said, quoting from the statutes, section 2322: "The \* \* \* locators shall have exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies within such surface lines extended downward vertically, although such veins, lodes or ledges may so far depart from the perpendicular in their course downward as to extend outside the vertical side lines of such surface locations." Continuing, the court used the following language: "So that the vested property right of the locator is limited to the surface and the veins apexing within its boundaries. Undoubtedly, therefore, until the entry (for patent) of the plaintiff's lode claims, and possibly until the issue of the patent, the defendant had the right to drive its tunnel through the subsurface of the plaintiff's lode claim. That ground still remained the property of the Government, and was free and open to exploration." To this decision considerable dissatisfaction was expressed, and the Cripple Creek company strenuously urged upon the Federal Supreme Court the advisability of a modification of recession from its position. The application for rehearing, however, failed of any result beyond the elimination of the doubt under the opinion as first written, as to the right of subsurface exploration between the time of final entry and payment and the time of issuance of patent. The doubt was clarified by the insertion, in place of the foregoing excerpt, of the following:

"The express grant to the locator made by this section (2322 R. S.) includes only the surface and the

veins apexing within the boundaries of the location. Until, therefore, by entry and payment to the Government, the equitable title to the ground passes to the locator, he is in no position to question any rights of exploration which are granted by the other provisions of the statute. The fee still remains with the Government."

## Mining Taxes in Mexico.

Mining conditions in Mexico are undergoing many important changes, particularly in the relations of the industry to the Government, which has recently made important concessions to the mine operators. Under existing laws, the mine operator never gets title to his mine, but holds it by paying taxes on the area claimed, the unit being the pertenencia, which is 100 meters square (10,000 square meters). No matter how many years the owner may have been paying taxes on his property, he is owner in name only, and should he fail in the prompt payment of these taxes, no matter how valuable or extensive the mine, or the length of time it has been in continuous operation, the property is seized by the Government for such default in payment of Federal taxes. The taxes are payable in advance every four months, or, at the option of the operator, may be paid in advance annually. The mine owners are making an effort to have such legislation passed as will give the mine owner a title in fee to mining claims upon which the tax has been paid for a stipulated number of years, this being as yet an undetermined period. The recent concessions made in the discontinuance of the levy of certain taxes will, it is estimated, make a difference of about \$4,000,000 annually to mine owners, which is a very substantial concession, and one which had been earnestly sought. The industry in Mexico has grown to such relatively stupendous proportions within the past decade that the Government could afford to make this concession, and wisely concluded, evidently, that it would stimulate mining investment still further, and that eventually the State will derive a greater benefit than under the previously existing conditions.

## Iron Anvil Blocks.

Managers of stamp mills on the Rand, South Africa, are endeavoring to increase the capacity of their hatteries, and in some instances have put in heavy iron anvils below the mortars, an idea derived from recent American practice. One of the first mills to install the iron anvil was the Village Deep at Johannesburg, where 14-ton blocks have been put in, resting on a cushion of heavy timbers which are placed on a concrete foundation, presumably in fear of the disintegration of the concrete, if the anvil blocks were placed directly on the concrete. If the concrete is made from suitable materials, in proper proportion, there should be no difficulty on this score, particularly in a region where extreme cold is unknown. It is true the vibration of a stamp battery is very great, but this vibration is largely absorbed by an iron block of fourteen tons weight. In the experience with the heavy steam stamps in the Lake Superior mills, it was at one time thought necessary to place heavy timbers beneath mortars, to avoid the rigidity now sought in stamp mill construction; but it was found that the iron anvil block gave an increased capacity and the "spring" timbers were abandoned. It is not unlikely that the greater number of stamp mills built in the future will be constructed with this idea of great rigidity in mind, and heavy anvils beneath the mortars become as common as wooden mortar blocks have been heretofore.

NOTWITHSTANDING the fact that iron making in blast furnaces of various types has been carried on for centuries, and the art has reached a high degree of perfection, there is comparatively little known of the reactions which take place in the furnace. The various improved steps in the perfection of iron blast furnace practice have been the result of previous experience and observation, rather than of scientific knowledge; in fact, the great progress that has been made has been the result of experiments, and often these have proven both expensive and unsatisfactory. This must continue to be the case until some more definite knowledge is gained, by which further experiment and improvement may be gauged and directed.



## CONCENTRATES.

TROY WEIGHT is used to measure gold, silver and precious stones. An avoirdupois pound (16 ounces) equals 14.58 troy ounces.

LITTLE good can be accomplished by filing the piston of a machine drill or of an engine of any description with a rasp or other type of coarse file.

BAILING SKIPS should be so constructed that they will not strike the surface of the water squarely, as this is likely to damage the skip and throw it off the track, if not held by guide rails.

THE beds of bituminous sand found in California and elsewhere are supposed by geologists to be petroleum-bearing strata, from which the volatile constituents have to a great extent disappeared.

DRY WASHING placer machines are successfully used where the gold-bearing material is light, dry and not cemented in any manner by lime, iron, clay or other minerals. These machines are usually of limited capacity.

CALCIUM SULPHATE has the property of retarding the setting of hydraulic cement. Up to a certain percentage the gypsum increases the strength of cement, but too large an amount has a tendency to cause disintegration.

IN making tests of mercury in the presence of salt (NaCl) and bluestone ( $\text{CuSO}_4$ ), it is important as to the relative amount of each of the substances used, for the reactions obtained with varying quantities of bluestone are widely different.

THE losses by chlorination process are ascribed by some metallurgists to the presence of lead in the charge, which is present in the ore, or concentrates in the form of galena which in roasting is reduced to metallic lead, occasioning a loss of gold.

STULLS may be safely employed up to a length of 20 feet, if the weight to be supported is not too great. Sometimes where long stulls are used it is a good idea for safety to place sprags at the centers reaching from stull to stull, thus securing greater rigidity.

THE Washoe smelter at Anaconda, Mont., is 25 miles from the mines, which are at Butte. The ore is transported in 50-ton steel cars. About 5000 tons of ore are treated at that plant daily, and the sulphurous fumes, if all converted into sulphuric acid, would produce over 2000 tons daily.

IT is a difficult thing to represent a plan and section of mine workings and also the geography and topography in a single sketch, as many attempt to do. It is only by long association with those who practice this method of description that the meaning of the person making such drawings can be comprehended.

THE occurrence of native sulphur in veins is due in most instances, if not always, to the oxidation of pyrite or other base metal sulphides. Instances of the occurrence of native sulphur rich in gold have been mentioned herein in the past, one notable occurrence being that at Cedros Island, off the coast of Lower California.

THE only safe device to attach a windlass rope to the bucket is a safety hook, which may be quickly detached when desired, but which will not release when the bucket strikes the walls or timbers of the shaft going either up or down. "Pigtail" hooks, looped ropes and other make-shift arrangements are dangerous and should not be used.

IT is not common to find alkaline sulphides in working cyanide solutions, though small amounts frequently occur in commercial KCy. Where precipitation is accomplished by means of zinc, it is generally thought that the zinc double cyanide in the solution precipitates as zinc sulphide any small amount of sulphide which may have been present in the solution.

THE length of time required to leach a charge in a cyanide vat varies from twenty-four hours to six days. This can only be determined by experiment, and experiments should be made on as large a scale as possible. Sometimes slow leaching is the result of too deep a charge, and better results are obtainable by working more shallow charges, and a greater number of them in a given time.

PECTOLITE, a silicate of soda and lime, often gives out a light when struck or broken in the dark. This is one of the well-known properties of zinc blende, that of emitting a phosphorescent-like light upon being broken or scratched. The property is of no known value. Some diamonds emit light in the dark after having been exposed to the strong light of the sun. Phosphorescence is a property of fluorite.

THE speed with which machine drilling may be accomplished depends to a great extent upon the superficial

area of the hole being drilled, as well as on the area of piston and air pressure. For this reason a small piston drill will often make as rapid progress in cutting, using a small bit, as a large machine using broad bits. In easy ground, or even "middling hard" ground, small drills— $\frac{1}{4}$ -inch to  $\frac{3}{4}$ -inch pistons—will often prove more economical than large machines using heavier steel and wider bits.

THE occurrence of native mercury in a cinnabar mine is not viewed with any particular satisfaction by the management, as it has been found that the native metal usually occurs near the bottom of an ore deposit, and its appearance has come to be considered by some as an indication of the "petering out" of that particular deposit in depth. Quicksilver in the form of cinnabar occurs in many different kinds of rocks, but is found in commercial quantities mostly associated with sandstone and serpentine.

THE State Legislature of California several years ago passed a law fixing a code of bell signals for use in mines of that State. While the State law does not plainly make it compulsory to use this State code, it clearly places the responsibility of any accident occurring through failure to use the code upon the management of the mine where such accident occurs. The code is in use throughout the State of California, with a few exceptions, and all who have used it agree that it is the best code thus far suggested by any State or body of miners.

A "TUNNEL LOCATION," as contemplated by the United States statutes, entitles the owner of such tunnel to only such veins cut by it that have not been previously discovered and located by others. As there is sometimes doubt as to the identity of a vein intersected by a tunnel or other workings at depth, it is occasionally necessary for the apex claimant of a vein to raise or sink on his vein from the level of the tunnel to the surface in order to prove the identity of his vein from the outcrop to the point at which an adverse claimant has undertaken to claim it.

THE report of the United States Naval "Liquid Fuel" Board, issued the past year, states that the supply of oil which is available for fuel in the United States is, first, the small percentage (probably not over 2% or 3%) of the total production of the Ohio and Pennsylvania oil—the residuum from the process of refining; second, the crude oil from the Indiana and Ohio fields, wherever the price of oil makes the burning of oil profitable at 95 cents to \$1 per barrel (plus freight); third, those portions of the California oil which are not best suited to refining; fourth, practically the entire output of the Texas field.

THE converting of sulphide copper-iron ores into sulphates is not always an easy operation. It occurs by natural decomposition of the ores, and to some extent is accomplished by roasting, but it is an easy matter to carry the roasting too far. It must be done slowly, and is usually attempted only with those ores containing a large amount of iron sulphide and a relatively small amount of copper sulphide. The roasting is usually done in heaps when a portion of the copper in the ore becomes sulphate and a portion is turned to oxide. If the roasting is preliminary to smelting there is little need of so much care, but if the process is preliminary to leaching the formation of large amounts of oxide, insoluble in water, should be guarded against.

THE occurrence of sulphides in modern volcanic lavas, such as basalt, is very rare. Pyrites and other base metal sulphides are not essential constituents of recent volcanic rocks, but at Sulphur Bank, Cal., cinnabar (sulphide of mercury) is found impregnating basalt, as the result of deposition of this mineral from hot springs immediately underneath the lava flow. Pyrite and other sulphides are abundant under proper conditions in many Tertiary lavas, such as the andesites and trachytes, as the result of infiltration from fissures in which mineral solutions were passing. Many valuable veins and ore deposits occur in rocks of this character.

ALL mining claims in Alaska are held under federal laws. The laws concerning liability of lease and bondholders of mines are not really mining laws. In some of the several States there are laws governing the liability of lease and bondholders, and in most of these the property holder may protect himself by posting a notice disclaiming any responsibility for debts contracted by those working the claim under lease or bond. An unpatented mining claim is recognized as "property" in the strictest sense of the term, and in the absence of any legislation on the subject it is presumable that a claim owner must protect himself against debts contracted by a leaser or bondholder on his property by posting a notice to this effect.

THE advisability of using machine drills in place of hand work in stopes must be determined by existing conditions. In ore bodies of large size, where the ore and walls are hard, large machines—3-inch to 3½-inch cylinders—are certainly advisable, but in stopes where the ore is much shattered or crumbling, small machines—2-inch or 2½-inch—should be employed, or hand work substituted for machine work altogether. In small veins where there is a liability to mix the waste from the walls with the ore the rock must be broken so as to

keep the ore and wall rock separate, and generally this can be best accomplished by first breaking the wall on one side or the other—stripping the ore—and after cleaning up the waste, to shoot down the ore separately. If either wall breaks more freely from the walls than the other, it is on this side that the stripping should be done. It is usually best to strip the hanging wall if possible, as this involves less danger of the vein falling after the support of the wall is removed.

THE strain on a cable hauling on an incline is not as great as winding in a vertical shaft. The less the degree of inclination the less the strain, and consequently the less power required to haul a given load. This weight of load on inclines is directly proportional to the sine of the angle of inclination. Thus: If a load of ten tons is to be hoisted from a shaft having an inclination of 60°, the effective weight of the load is as ten tons is to the sine of 60°, or 8.66 tons. If an engine can hoist a load of five tons from a vertical shaft, this engine will hoist a ten-ton load up an incline of 30°. In this case the relation is as the cosecant of the angle. These are theoretical computations, to which must be added the friction of the wheels on axles and rails. This friction is usually figured from 30 to 100 pounds per ton, and is of greater importance on shafts of low angle than those of steep pitch, and the friction will vary more or less, also, according to the condition of the shaft. Where a change in dip occurs, the friction is greatly increased, as is also the case in very deep inclines, where the rope sags to such an extent as to drag on the timbers or run on idlers placed in the shaft. Under such conditions the friction factor may be as high as 10%.

BAUXITE is an oxide of alumina, containing alumina 73.9 and water 26.1. The bauxite of France, near Baux, occurs mostly in the form of grains in compact limestone. Other and more extensive deposits are found in old lake beds. Well-known American localities in the United States are Saline and Pulaski counties, Arkansas; Cherokee and Calhoun counties, Alabama, and Floyd, Barton and Walker counties, Georgia. The deposits in Arkansas are the most extensively worked and occur associated with eolite-syenite, a portion being due to replacement of the eolite and another part being due to decomposition of the feldspar and eolite and the precipitation of the aluminum mineral as a hydrate. The first form usually preserves the form of the eolite and is in place in bunches; the second forms beds about 20 feet in thickness which lie along the slopes of the ridges of eolite-syenite and extend some distance out into the valley as flat sheets. The ore is mined by a system of open cuts. In these deposits the successive stages of deposition are marked by layers of iron oxide, which must be hand-picked from the bauxite. The mineral is earthy and clay-like, sometimes colored pink, red and violet from presence of iron oxide. Gibbsite is very similar to bauxite in composition, but has a gray to greenish color and is usually crystallized, incrusting, or in rounded concretions. It has a smooth surface and often a faint fibrous structure within.

THERE is no material difference in the method of formation of a vein fissure and a fissure in which no mineral has been deposited. A fault fissure is one in which the walls have been subjected to a greater or less movement—the hanging wall having been shifted up or down or laterally with reference to the foot wall. A simple fissure may exist as a crack or fracture in the rock, no perceptible movement of the walls having taken place. Either of these types of fissure may occur between rocks of unlike character, as limestone and porphyry or quartzite and shale, or the fissure may cut across the stratification of the rocks both in strike and dip, or may occur wholly within one kind of rock. The only material difference between a vein and a fissure without ore is one contains ore and the other does not, and that portion of a fissure in which no ore occurs—that part between the pay shoots, for instance—is in all essential particulars the same thing as a fissure entirely destitute of ore. The most important distinction between fissures is in the comparison of those occurring in the same mine and having different strike and dip, the one intersecting the other. Miners usually refer to the later fissure as a cross-head or cross-course. Often both the older and the younger of such intersecting fissures contain ore, but usually one is much more valuable than the other. Fissures often occur cutting veins and which are simply fractures or fissures filled with broken country rock ground from the walls by movement, part of which is coarse and part is fine, all the fragments being angular; but in the fissure no ore deposition has taken place. The illustration submitted by A. E. R., from Bald Butte, Mont., indicates that there was probably first formed a fissure in which there was sufficient movement to crush the country rock between the two planes or walls of the fissure and that this crushed material was infiltrated with silica, which to a greater or less extent replaced the crushed material. Later the rock masses were again subjected to further movement, and the hanging wall slates were crushed between the main quartz vein and the subsidiary planes of displacement formed by the pressure and movement in the hanging wall. These processes are of very common occurrence, and often in some part of the vein the mineralization of this zone of later fissuring on the hanging wall—and sometimes on the foot wall—is sufficient to constitute a good body of pay rock.



## A Large Gold Dredger.\*

The Folsom Development Co. of Folsom, Cal., have recently put in commission the largest placer mining dredger that has yet been constructed in this country and what is said to be the largest placer mining dredger in the world. A great deal has been written on the subject of dredger mining, and the progress of the art has had considerable attention in this journal.

The Folsom Development Co. owns a considerable acreage on the American river just below the town of Folsom, Cal. They are at present operating two placer mining dredgers of the Bucyrus type, built by the Western Engineering & Construction Co. of San Francisco, and which have given excellent and satisfactory results. These two dredgers, one of which is shown in illustration No. 1, were put in commission about February 1, 1904, about which time the Folsom Machine Co. started work on the design and construction of the third dredger which is known as No. 3. There was much to be said on both sides of the question as to whether the larger capacity and heavier machinery of a dredger of the proposed size would prove economical and efficient, or whether the increased size of the dredger and its parts would prove a detriment rather than an advantage. The matter was, however, settled by a decision to try the experiment, it being evident that such a question could only be proven by time and the actual operation of the larger machine under conditions similar to those under which smaller machines were in general use.

The dredger design was started February 1, 1904, and power was turned on and the machine started during the earlier part of December of the same year. This is believed to be a remarkably short period for the design and construction of a dredger of this size.

Technically, the dredger is of the single lift type with continuous buckets, flat screens and rubber belt stacker. It is electrically driven and is provided with a head line anchorage, as well as spuds.

Fig. 2 shows the start of the actual work of construction of the hull. A pit has been excavated alongside the railroad, and false work put up, on which the frames of the hull are being erected. Fig. 3 shows a more advanced stage of construction, some of the superstructure, for supporting the machinery, being in place, and the hull being partially planked. This hull is 120 feet long, 43 feet wide on the water line, and 10 feet deep over all. It is built of the best quality of Oregon pine obtainable, upwards of 300 M. feet of lumber being used in its construction, and weighing when complete, ready for the machinery, about 750,000 pounds. The hull has a displacement of 24,440 pounds per inch of immersion.

To an Eastern reader the timbers used in constructing a dredger of this size may appear enormous. Large quantities of timber surfaced on all sides and ranging from 8"x10"x42' long, to 18"x24"x40' to 60' long are used, and a wooden spud, for use as a swinging spud, is used and is constructed from a single stick 30"x42" about 55 feet long. When the hull is complete and caulked, water is turned into the pit from an irrigating ditch and the hull is floated off from the false work ready for the erection of the machinery. Fig. 4 shows the condition of the hull at this time.

Fig. 5 shows the start of the work of erecting the machinery. The ladder frame has been put in place and the buckets are being strung. This ladder frame is a deep plate girder of structural steel weighing upwards of 80,000 pounds; it is suspended from a nickel steel, hollow-forged shaft 13 inches in diameter resting in heavy cast steel bearings. The lower end of the frame is provided with a heavy bail and blocks, corresponding with a tackle block, on the top of the front gantry by which the frame may be raised and lowered. The top side of the ladder frame is provided with chilled iron rollers 16 inches in diameter for supporting the chain of buckets. The bucket chain consists of eighty-two buckets of about 9 cubic feet capacity each, built to form a continuous chain, the articulations of which are forged nickel steel pins 6 inches in diameter. A bucket complete weighs 2550 pounds and consists of a massive cast steel back or link, a sheet steel hood and a cutting lip of manganese steel, all securely riveted together. At normal speed this immense chain is driven at a rate of about 45 feet to 50 feet per minute, delivering the contents of twenty buckets per minute to the hopper from which the excavated material passes to the screens.

The chain is driven by a 150 H. P. variable speed induction motor through heavy gearing, all of the shafts employed in the transmission being forged from nickel steel and all of the gears being cast steel with machined teeth. The size of the parts of this main drive may be approximated by reference to Fig. 12, the main gears being slightly over 12 feet 8 inches in diameter, the shaft on which they are mounted being 15½ inches in diameter at the center and nearly 12 feet long, weighing almost 7000 pounds. Figs. 10 and 11 show the lower end of the excavating machinery submerged and the buckets coming up

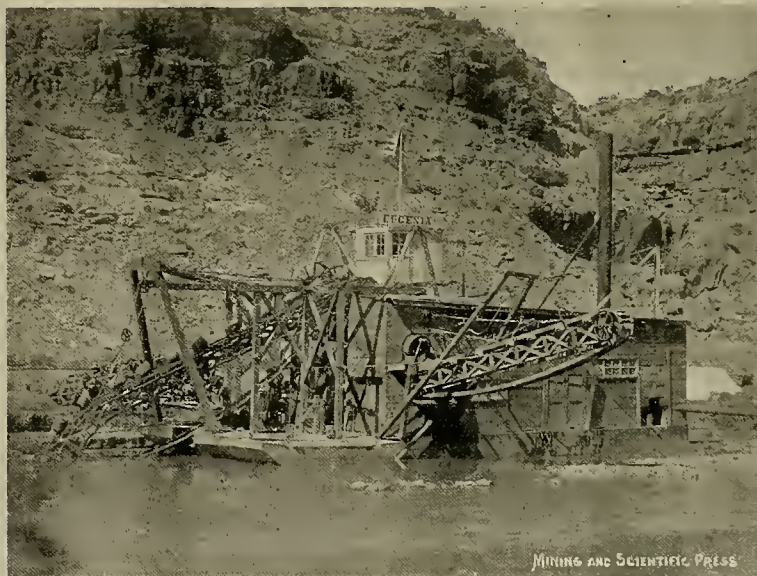
out of the water, passing up the ladder frame to deliver their contents to the hopper; No. 10 being taken from the bank nearly in front of the dredger and No. 11 taken from the heavy timbers forming the frame from which the ladder is raised and lowered, and showing the buckets passing the pilot house. The pilot house contains the switch board for distribution of the electric current to the various motors and lights, and the levers for manipulating the various clutches, brakes, etc., used in the operation of the dredger. From his windows the winchman can see his work, watch the buckets to see that he is filling them properly, and, by the shifting of levers, he can control the speed of the buckets, and, in fact, all of the operations of the dredger. An annunciator on the wall in front of him serves to notify him if any of the machinery on the lower deck should go wrong



Fig. 5.—Stringing Buckets.

and at the same time shows which of the various machines it is that may be giving trouble.

The material that is delivered by the buckets to the hopper is fed by it to a pair of huge, flat screens arranged tandem and driven by a cranked shaft at 130 strokes of 4 inches each per minute; over these screens are perforated pipes from which some 5000 gallons of water per minute is sprayed over the gravel, washing the finer portion and the values through the screens to the mercury tables below



One of the Early Dredgers.

where the values are concentrated and saved, the fine sands being washed astern of the dredger through steel sluices.

The coarse material, which passes over the screens, is delivered to a 42-inch rubber belt conveyor mounted on a steel truss which overhangs the stern of the dredger and carries the tailings astern and stacks them up to such a height that they will not interfere with the further manipulation of the dredger.

The driving end of this conveyor is illustrated in Fig. 7, the framework and idlers without the belt in Fig. 8 and the conveyor with belt in place in Fig. 9.

The electrical equipment of this dredger comprises a 150 H. P. variable speed motor for driving the buckets; a 30 H. P. var. speed motor for the main winch; 100 H. P. constant speed motor for main

pumps; 7½ H. P. for hilge pump; two 40 H. P. for sand pumps; a 40 H. P. for the screens; 15 H. P. for the stacker and over 200 16 C. P. lights. The motors are all alternating current induction motors, and all of them of 50 H. P. and over are on a 2200-volt circuit; the smaller motors are on 440-volt circuits. The current is brought on board through a heavy, insulated cable containing three No. 0 conductors. The cable may be attached to any one of three



Fig. 14.—Side View—Just Started.



Fig. 15.—Side View—With Tailings.

terminal panels, one of which is located on the front of the pilot house for use when working on a head line, the other two being placed on opposite sides of the rear end of the screen house and from these terminals it is led to the main switch and circuit breaker on the switchboard in the pilot house. The switchboard is of blue Vermont marble in three panels and is provided with the usual lamps and instruments and also with oil switches which control every circuit on the dredger. Three 30 K. W., O. D.

type transformers, 2200 to 440 volt, are provided on the lower deck for supplying the lower voltage current used by the smaller motors. These transformers are placed in a special compartment opening only to the outside of the dredger, each transformer being placed in a sheet steel tank and the compartment being lined with asbestos covered with galvanized iron for protection against possible fire. The transformers are shown in place in Fig. 13.

Fig. 14 shows the side view of the completed dredger very shortly after it commenced actual work and Fig. 15 was taken through the piles of tailings after the dredger had been in operation about a month. The theoretical capacity of a dredger of this size should be nearly 8000 yards bank measure per day, but such theoretical capacity is not attained in

\* See illustrations on front page.



actual work, 50% to 55% of the theoretical capacity being the average in actual work.

This dredger therefore may be expected to handle from 125,000 to 140,000 cubic yards per month on an average, and the problem to be worked out on this machine is whether the larger machine, with its proportionally greater capacity, will so reduce the cost of handling the material that lower grade ground, that has heretofore been considered unprofitable, may be made available.

This dredger was designed by and constructed under the supervision of George L. Holmes, formerly in

As a rule, the pay gravel is not cemented, but in some places bordering on the foot of the hills it is slightly so. The conglomerations of gravel occasionally encountered are not very hard and are easily broken with hammers. The bedrock is brown slate and diorite, lying in parallel bands, having a trend N.-N.W. and S.-S.E. and dipping to the east 25°. The average depth of the pay gravel, which is next to bedrock, is about 4 feet. The whole depth of overlying gravel and loam to be removed by stripping is about 26 feet. The pay gravel is subsequently sluiced and the bedrock swept. All of the material

tend with about 40 miner's inches of water daily. In the winter time, during floods, about 500 and sometimes 600 inches are encountered. In the pay gravel in places or "spots" a great many coarse flat rocks, water-worn, but not large, round boulders, are encountered.

A full crew, night and day, consists of twenty-five to thirty white men, employed in running the machinery, in superintending washing pits, and watchmen for watching and bossing the Chinese. White men receive from \$1.25 to \$3 per day, with board and lodging. The wages of Chinese are \$1.25 per day, without board. The machinery has never been in full operation until this summer. It is now working to entire satisfaction. The gross production is from \$6000 to \$12,000 per month.

Altitude.....	330 feet
Course of lead.....	N.-N.W. and S.-S.E.
Nature of pay gravel.....	Loose bluish wash gravel
Nature of bedrock.....	Slate and diorite
Depth of overlying gravel and loam.....	23 feet
Depth of pay gravel.....	4 feet
Length of time worked.....	4 years
Number of men worked.....	25 to 30 white men; 80 Chinese
Gross monthly product.....	\$6,000 to \$12,000
Gold fineness.....	852 to 872

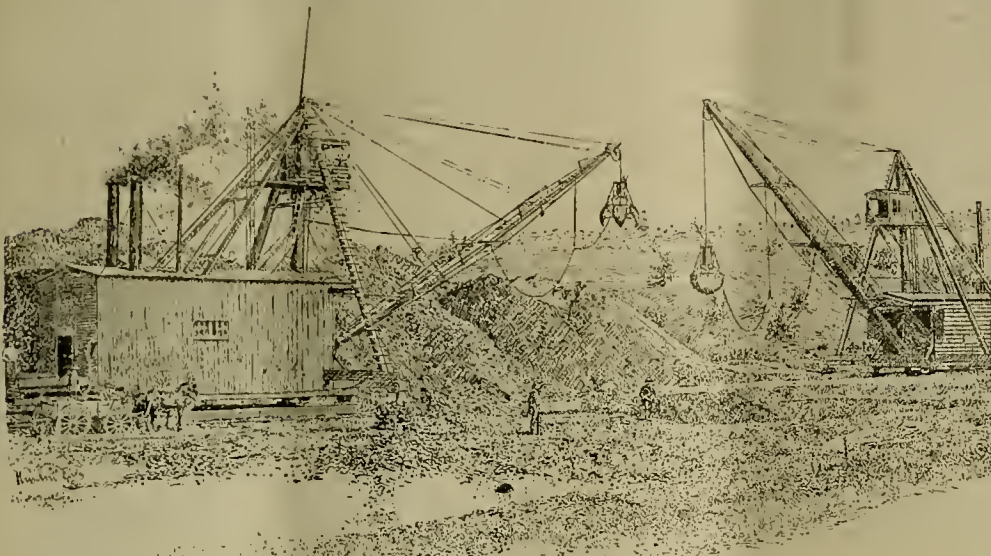
The gold, 872 fine, comes from the north side of the creek, showing that there are two sources of gold—one, probably, from the gold belt higher in the mountains, the other from the country on each side of the ravine. The gold is what is termed fine gold and in character is flattened. It is sometimes attached to small fragments of quartz which do not seem to have come from the mother lode, along which Dry creek runs, some 7 or 8 miles higher up the mountain.

Large excavations are made by mechanical removal of the gravel. In the last two months one excavation, having a length of 800 feet and an average width of 60 feet and depth of 30 feet, has been made. The material overlying the pay gravel is gripped by automatic grappling buckets, self-filling and self-dumping (engravings of which are shown), swung by machinery to the required distance and dumped. The usual load of the buckets is two cubic yards. One cubic yard of the gravel weighs 1080 pounds; one cubic yard of the loam and gravel weighs 775 pounds. Commencing at the foot of the hill at any desired point, the gravel is seized and transported to any point within a radius of the capacity of the machine. The present derricks can pile it to a height of 45 feet. The buckets are swung by a boom, which is 114 feet long and describes a semi-circle in the air of 220 feet. The bucket rises from the ground, the arm of the derrick swings toward the point designated, dumps its load and returns to refill itself, consuming from three-quarters of a minute to two minutes on the trip, according to the height it is raised and the distance swung.

At one end of the claim in the bed of the creek is a pump pit, 36 feet deep, 10 feet wide and 25 feet long, housed, in which are two centrifugal pumps for handling the water encountered in the mine. From the bottom of this pit culverts are extended in all directions as work advances. In the fall of the year a penstock is built at the heads of the culverts, and in the spring the culverts are again extended. Several important improvements in this pumping machinery have been made by Mr. Lambing, the superintendent, in the matter of annular casings and in rests for the vertical shaft of the pumps. A tappet, having a steel face on the underside and secured to the shaft by set screws, rests on two cast iron pulleys, revolving on a horizontal shaft in opposite directions. In this way the wear of the rest is reduced to a minimum. These pumps are each driven by a 16 inch Knight's wheel with turbine attachment, having twelve nozzles with apertures 2½ inches by 1 inch. The head of water above the wheel is 68 feet. A 22-inch pipe conveys water for power to drive the pumps, and there is at command 500 inches of water, with pressure of about twenty-nine pounds to the square inch. One pump is kept running at a time.

From the bottom of the pump pit, directly under the pump house and 33 feet below the surface of the ground, the culvert is started in the bedrock, to get the proper grade, and is carried along as work progresses with a grade of ¼ inch in 12 feet. The pumps are submerged and placed on the bedrock in the bottom of the pit. The culvert, 14x20 inches, is laid as fast as work goes on right up to the face of the excavation. By this means all water is drained from the ground, being worked to the pump pit. Above this culvert another similar one is laid, which carries the sluice water also to the pump pit. The bedrock culvert is kept open with a screen over the upper end. The water which is pumped to the surface is carried off by sluices. If water for sluicing becomes scarce, a portion of this water is conveyed back in pipes to use in sluicing. The culverts have branches at right angles, running to the face being worked or running in all directions where work is being carried on. The sluices in which the gold is saved have a grade of 7 inches to 12 feet; they are of a common style, with slats 3x2 inches laid flat through their entire length.

Quicksilver is sprinkled in the sluices according to the grade of the gravel, an ounce or two every two to four hours. The loss of quicksilver does not exceed twenty-five pounds per annum. The greatest loss is occasioned by retorting in the open air. Two derricks are employed; the weight of each, including accompanying machinery, is from seventy-five to eighty



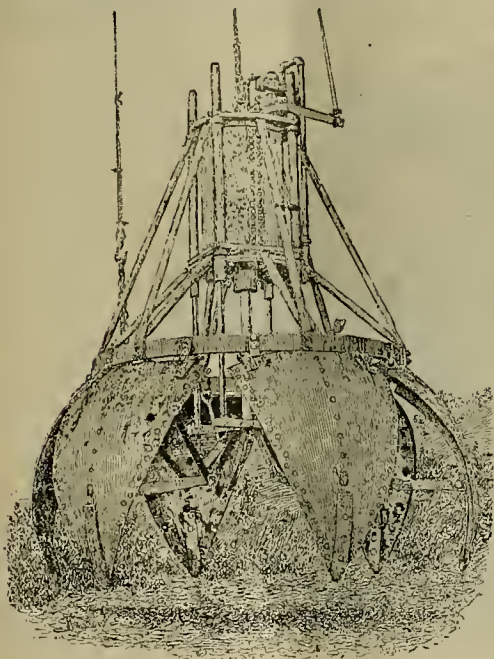
Dredgers at Work in Arroyo Seco, Near Ione, Cal.

charge of the dredger department of The Link-Belt Machinery Co. of Chicago, to whom we are indebted for the illustrations and description.

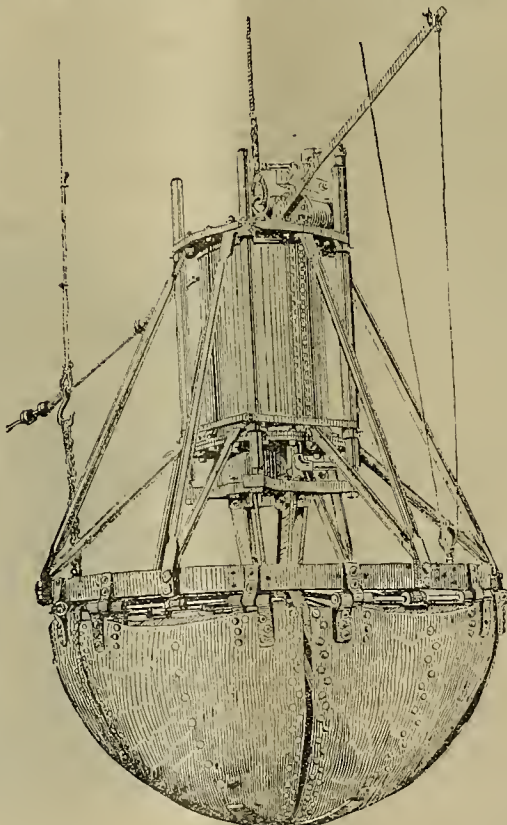
In 1886 dredging operations were successfully carried on in New Zealand and the proposition of dredging California rivers began to be discussed about that time. One of the first types of dredging boat was the Ball or suction dredger, and, while dredgers of this kind have been successfully operated in harbors, handling silt and mud, they have never given satisfactory results when applied to gravel mining.

The early history of dredging in California is interesting, particularly when the machines in use in the

deposited above the pay gravel is removed mechanically by devices which are the outgrowth of working this mine. A description of the mechanical contrivances used and the methods employed at the mine, now in successful operation, after other processes were found unremunerative, is given at some length,



The Dredger Bucket Open.



The Bucket Closed.

earlier days and the methods then employed are contrasted with those of the present time. One of the first dredging operations in California was carried on at the Arroyo Seco mine, near Ione, Amador county. The following description of the remarkable machine used there in 1887 and the methods of working are thus described in the eighth annual report of the State Mineralogist of California:

This mine, also known as the Lambing, is situated in the Irish Hill district, 3 miles north of Ione, on what is called the A. D. Ranch. It is worked under a lease, purchased in 1883 from the railroad company. The original term of the lease was for fifteen years and it calls for forty-five acres, more or less. The claim is 2700 feet long, with an average width of 700 feet. It follows the bed of Dry creek in its course and extends from hill to hill on either side.

not so much for the purpose of representing a local mining plant, as to call attention to a novel way of handling a gravel mine, which undoubtedly is applicable to numerous other sections in this State, though ground has never been worked in this manner elsewhere. The mining operations are carried on principally in the dry season, and in the bed of a creek and on its sides, with the water of the creek turned from its course. The claim has been worked for four years. During this time the machinery here employed was invented and built as its adaptability was ascertained. The width of the pay channel varies. It is supposed that it pays for about 700 feet in width. The creek has apparently changed from every point, from hill to hill, from time to time in years gone by. Under the present system of working no timbering is required. In the dry season the mine has to con-



tons. The length of the boom, the outer end of which is elevated 58 feet, is 114 feet; it is capable of carrying a load of seven tons, but usually lifts about two cubic yards of gravel. The boom is made of Oregon pine, 12x18 inches at the foot, 12x24 inches in the middle and 12x12 inches at the outer end, where a 4-foot sheave is located, which carries the hoisting cable, a flexible steel wire rope, 1 inch in diameter. Before using tar, two ropes per annum were required. After using tar occasionally, one rope only was needed yearly. By tarring every three or four days, the rope has kept in good condition for the last two years. The machine is handled by an operator, called a lever tender, who stands about 50 feet above the foot of the mast, in a little house near the top of the mast, where levers are attached by gaspipe to the machinery below. All is under the management of this man, who, owing to his elevated position, has full view of the surroundings and perfect control of the entire operation.

The steam cylinder is located on top of the bucket; the steam passes through inch gaspipes of various lengths, connected with globe and socket joints for flexibility.

Carbolized steam hose, which was at first used, was found to be insufficiently durable to be effective.

The pipe connects the cylinder with the steam drum of the boiler of the derrick. As soon as the bucket on descending has reached the gravel, steam is turned into the cylinder by means of a five-way valve below the piston head. This causes the piston rod to rise and draw together the clamping parts of the bucket which enfold the load; by turning the valve still farther, the steam enters above the piston head, forces the rod down and empties the bucket; turned still farther, the steam escapes. Each derrick has two boilers and two engines provided with link motion. Two of the engines have 9x12-inch and the two others 8x12-inch cylinder and stroke respectively. In order to furnish dry steam for greater effectiveness, a large steam drum has been placed over each of the two drums on the boilers of each derrick. Each of these derricks consume about 4½ tons of lone coal in twenty-four hours, an equivalent of about 4½ cords of pine wood.

The cost of the coal delivered at the derricks is \$2 50 per ton of 2000 pounds. The derricks are easily moved forward and backward by the same engines that hoist the buckets. By throwing a clutch in gear, they become locomotives and run forward or backward at will. The machine rests on a solid railroad track, with 16-foot gauge, and the heaviest rails are employed. The track is laid on heavy Oregon pine timbers 12x16 inches in size. Twice as much track is laid as the derrick covers. As the derrick advances, the length of timber behind is removed to the front. If the movement is backward, the track in front is removed and laid in the rear. The cost of a single derrick has been about \$10,000.

In 1888 a dredger was placed on the Carson river near Dayton, Nev., to work for quicksilver and amalgam which had come down the river from the various mills working Comstock ores, but this enterprise was not a success.

One of the early dredgers in California was of the steam shovel type, with a single scoop or bucket. This was in operation on the Sacramento river near Redding, and was known as the Diestleborst dredger.

### Effect of Salt and Bluestone on Mercury in Pan Amalgamation.

TO THE EDITOR:—Practical experiments such as those described by A. E. Drucker in his interesting article on "Pan Amalgamation" in your issue of April 15 are always of value, yet I have lately heard of several mills in Sonora where the traditional salt and bluestone process has failed to give satisfactory results, and I know of one mill where a great gain has come from leaving out the bluestone from the pans altogether. At the same place experiments are now being made to determine whether it will be best to leave out the salt also. So many pan amalgamation mills are in use that it seems to be important to once more reopen the question of the use of bluestone.

It recently became necessary for me to inquire why there was such a large loss of mercury in a certain mill where the salt and bluestone process was used. Being away from all but a few reagents I could only make a few simple experiments, as follows.

Mr. Drucker notes that when quicksilver, salt and bluestone are boiled in water in a test tube the mercury soon divides into small particles which are coated with a gray substance which he assumes to be calomel. My first experiment was to boil bright, clean mercury in a solution of common salt. The mercury remained clean and bright. Hence, if a chloride of mercury was being formed it must have been the soluble corrosive sublimate ( $\text{HgCl}_2$ ) and not calomel ( $\text{Hg}_2\text{Cl}_2$ ). Of course the result might have been different if the mercury had been boiled for a very long time or had remained in the salt solution for days or weeks.

Next, clean mercury was boiled in a solution of bluestone. In a few minutes the mercury had been reduced to gray granules, many of them being microscopically small. They had no metallic luster. Next, clean mercury was boiled in a solution of salt

and bluestone mixed. Then followed what Mr. Drucker describes—the mercury was soon divided into gray granules, and the eye could not distinguish them from those formed when the mercury was boiled in the solution of bluestone alone. In other words, the quicksilver had not only been "floured" (reduced to fine globules of metallic luster), it had been "sickened" (coated with a substance having a non-metallic luster and resisting amalgamation). It thus appeared that mercury can be decomposed by copper sulphate, but I had no means of analyzing the gray coating. It cannot be calomel, for there was no chlorine in the solution. Probably one of the sulphates of mercury is formed, and if so the copper will naturally be left as a soluble sub-sulphate or as a part of the gray coating in the form of an insoluble oxide or other compound.

Of course such incomplete experiments do not warrant theories. But on the face of it the role of copper sulphate seems to consist in sickening or decomposing the quicksilver. The addition of the salt does not prevent the sickening. At this point many chemical questions naturally arise. For instance: Is the gray coating that forms on the mercury when it is boiled in the solution of bluestone the same as that which forms when it is boiled in the solution of both salt and bluestone? Is this coating a chloride or (in part, at least) a sulphate? Does zinc amalgam in the pan have any other mission than to undo a mischief already wrought by the bluestone? Is zinc chloride or zinc sulphate the result? What ores will prevent the solution of mixed salt and bluestone from attacking the metallic iron scales from the stamps, thus forming iron sulphate and metallic copper, the latter then becoming a part of the amalgam? If, in the case mentioned by Mr. Drucker, there was no copper in the amalgam, was this due to the copper having become a soluble chloride, or did it exist in some other non-amalgamable form, perhaps because of the presence of the zinc blende, the galena, etc.? What class of ores does the bluestone help to amalgamate, etc.?

If we are to use the bluestone in spite of the fact that its first effect is to decompose the quicksilver, why? If it is of use in amalgamation, the fact can be proved scientifically by exact chemical analysis and practical experiment. Has any one done so?

G. H. STONE.

The Babicanora Mine, Arizpe, Sonora, Mexico, April 23.

### The Lead Fields of Laurium, Greece.

Laurion, or Laurium, is a promontory in southwest Attica, Greece, projecting into the Egean sea, and is celebrated for its lead mines, which have been worked since prehistoric times.

The mines are supposed to have been operated first by the Pœnicians in the sixth century B. C., and,

The largest company in this field is the Compagnie Française de Mines du Laurium, whose output in 1904 was over 250,000 tons.

The mixed sulphide ores of this district resemble those of Leadville, Colo. An average of this ore would be about 10% lead, 12% zinc and 15% iron in the form of pyrite in a gangue of quartz and calcite, which is generally mixed more or less with siderite and carbonates of manganese. The Soureza ores are chiefly galena (with some lead carbonate) and zinc carbonate in a gangue of calc spar and fluor spar—sometimes as much as 30% of the latter, with very little iron or silica. In bulk they run about 10% to 12% lead, with probably ten or twelve ounces silver to the ton.

The accompanying cut shows the latest type of large modern silver-lead furnace, recently ordered for this district. This furnace is 48x160 inches internal dimensions, and was built by the Colorado Iron Works Co. at their plant in Denver, Colo. It has a capacity of about 200 tons per day.

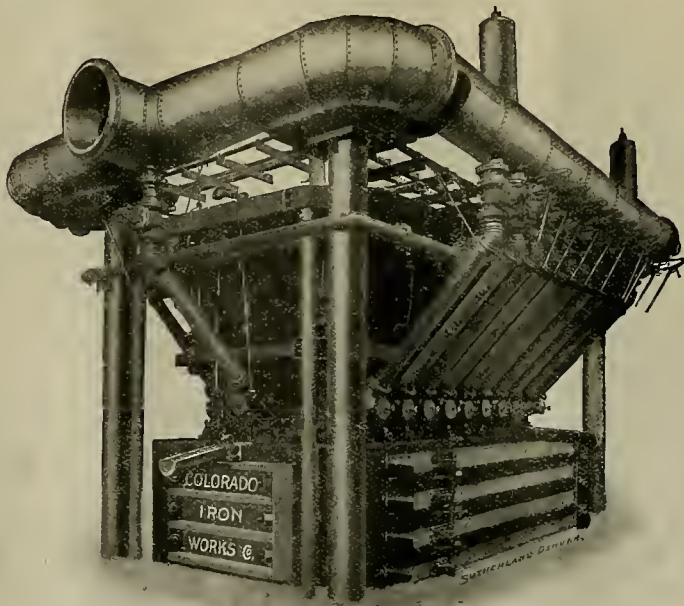
The mines of Laurium are about 50 miles from Athens, with which they are connected by rail through the port of Laurium or Ergasteria, and has a good harbor and a population of about 20,000.

## THE PROSPECTOR.

The samples from Jefferson county, Wash., are determined as follows: No. 1. The red ore is hematite (iron oxide). No. 2. The black ore is a siliceous rock containing considerable black oxide of manganese. No. 3 is a copper ore consisting of a granular rock containing several per cent of bornite (copper sulphide) and malachite, green copper carbonate. As these minerals occur in separate and distinct layers, but in the same vein or fissure, they apparently have some relation. The iron oxide is a common occurrence in the outcrop of copper veins and so also is manganese. Often where the latter is found associated with copper ores, silver, and sometimes gold, is also present.

The ore from Bisbee, Ariz., marked J. M. M., is bismuthinite (bismuth glance). When pure it contains sulphur 18.8%, bismuth 81.2%. The specimen contains considerable disseminated iron and copper sulphide, and in the gangue, silica, calcium carbonate and magnesia.

The mineral from Patagonia, Ariz., is pyrite (iron sulphides) and marcasite, with a few very small grains of copper sulphide. Arsenic is also present and shows in the yellowish stain along one side of the specimen, where the ore is slightly oxidized. There is some disseminated quartz. The ore may contain



Large Modern Silver-Lead Furnace.

with the growth of Athenian supremacy, they were of the greatest commercial value to the State. The chief product of the mines in the earlier periods of their working was silver, although large quantities of lead were obtained, and the yield of minium (red oxide of lead) was of appreciable value.

In 1860 a Marseilles company bought the right to work over the heaps of refuse, from which much lead was extracted. In 1869 a dispute arose over limitations imposed by the contract, and after a protracted lawsuit the company, in 1873, purchased a large tract of land.

Since then several companies have occupied the territory, and carry on profitable operations in the production of lead and kindred metals. Silver, the most important metal in ancient times, is, however, of little value at present.

gold and silver. The presence of the former should be detected by careful roasting, grinding in a mortar and panning, unless the gold is very fine. The best way is to have a sample assayed. It may be shipping ore for all that can be told by looking at it, while on the other hand such ore is often too low grade in precious metals to make its treatment profitable.

The white mineral specimen from El Dorado county, Cal., is a siliceous talc schist. It is probably the result of the alteration of a basic rock of some kind, impossible from the specimen to determine.

The rocks from Salt Lake City, Utah, marked E. C. D. M., are: 1. Garnet rock. 2. Dolomite. 3. Greenstone. 4. Calcium carbonate.



## Vertical Shaft Sinking on the Rand.

Written by H. FRASER ROCHE.

Shaft sinking by hand has fallen somewhat into disuse since the war, and this, I think, can be safely attributed to our labor troubles. The best sinking by hand labor was done at the Jupiter East shaft, prior to the war and the figures from there may be cited as an example of this method of sinking. This shaft was 28x8 feet, and was worked in three shifts of eight hours each, the number of boys employed on each shift being from forty to fifty. Each shift, when going on, cleaned out the ground broken by the one preceding it, and then commenced drilling double handed. The ground was carried in as many benches as possible, the top bench being often 20 feet above the sump, which was composed of a four-holed cut. When an average of 3 feet was reached in most of the holes, they were charged up and fired in the usual manner, the cut coming first. In one month 211 feet were sunk in this manner with buckets, and an average taken over ten months gave 165 feet per month. The conditions under which this sinking was accomplished were nearly perfect, the shaft being absolutely dry, the boys (Basutos) excellent, and the three contractors among the best miners to be found in this country. The timbering was done in the usual manner, and always kept within at least 30 feet of the bottom of the shaft. The total cost averaged approximately £20 per foot. The great influx of unskilled labor may probably cause many of our engineers to revert to hand labor wherever possible, as this is here the cheapest and most rapid

suitable and regular intervals. The proximity of the timber to the bottom of the shaft is of great value in rapidly removing the smoke and gas after blasting, since ventilating pipes can be carried down to the bottom set and connected with a fan at the bank-head. Till October, 1904, the South Nourse held the record for shaft sinking with machines.

Another method is that employed at the Village Deep, in the Western shaft. A double direct-acting engine, 250 H. P., is used with buckets. This engine has been augmented by a smaller geared hoist and bucket. The buckets run in crossheads with steel shoes on wooden runners. The tipping process with these buckets is far inferior to the skip method. The three center compartments are used for hoisting, the Eastern one for pump, air main and ladder way, and the remaining one kept clear. The sinking is carried on as follows:

Four bars are rigged—two of them 1 to 3 feet from the end of the shaft, and the other two 7 feet from each of these. Three 34-inch Ingersoll-Sergeant machines were used on each bar, each side machine drilling three holes, the center ones drilling three also, but sometimes one of these was omitted when the ground allowed. These were tended by eight white men with native helpers. The cut holes are drilled 10 feet deep, and the side 8 to 9 feet, all being started with star bits and completed with a succession of chisels, the average time taken during October for drilling being eight hours. All were then charged and blasted together, this blast generally breaking 4 feet of ground. Cleaning down the timbers could not be started for fully an hour afterwards, owing to the bad ventilation, and an hour and

bottom of the shaft. This gear was designed to carry 4-ton skips on 60-pound rails, 4 feet 4 inch gauge, with guide rails of same weight, 2 feet gauge. These rails are riveted on cast iron brackets, 6 feet centers and through bolted to the dividers. The distance pieces used were 9 inches by 2 inches. These rails have been placed in the Village Deep No. 1 shaft, and have been found highly satisfactory. Ten thousand three hundred feet of rails were placed in position in nine days.

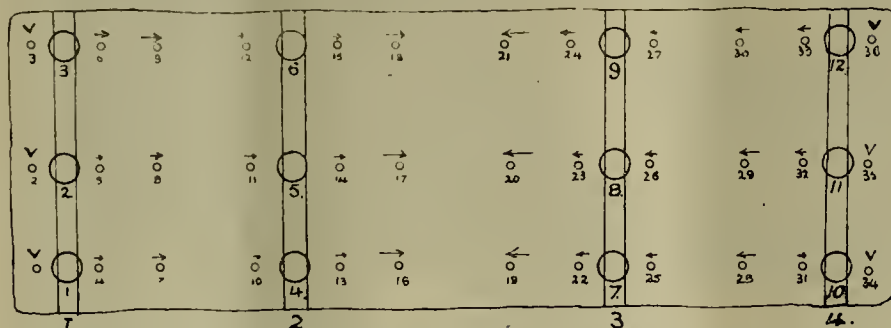
On several occasions strong feeders of water were passed through and gave rise to a lot of trouble. These were dealt with by placing water rugs at the first timber set below the feeder, and then blocking the set as closely as possible to the sides of the shaft. Good strong clay was then tamped into the crevices, thus making a water-tight joint with the sides of the shaft. If necessary, the spaces between the studdles were raised 3 inches by means of closely fitting slats. The whole ring was then surfaced out and tamped with clay, and given a slight fall towards the pumping compartment, where a 2-inch pipe was placed in the ring, leading to a 600-gallon tank, which formed the sump for a suitably sized pump. A good deal of water was encountered in this shaft, it being found necessary to ring it at the 300, 600 and 800-foot levels, and air pumps were used in connection with tank sumps at these points, with a sinking pump always at the bottom. A big break with north and south strike dipping 80° east was met with 400 feet down, but left at 700 feet, and this gave rise to most of the water. At the 1000-foot level a big pumping station and sump were cut, the excavation amounting to over 700 cubic yards. The break was again encountered in the excavation and a strong timber and clay dam was built forming a sump of 50,000-gallon capacity. A Riedler air pump, 25 H. P., with reheater, was put down, with an electrical pump as a stand-by, and an 8-inch column takes all the water from here to the surface. At 1200 feet another large feeder of water was cut and successfully ringed, and led into a 600-gallon tank, which formed the sump of a 16-inch by 8-inch pump. At 2120 feet a similar station to that at 1000 feet is being cut for the reception of pumps. During the last six months an average of 3500 gallons of water per hour has been brought to the surface.

There are some interesting facts to be learned from the Cinderella Deep shaft. This was sunk mostly by machines, four only being used at one time, and the average monthly sinking during 1903 was 96½ feet. This shaft has been remarkable for the low consumption of dynamite, 0.602 pound per ton of rock hoisted, and the very low cost during that period, viz., £20 per foot. As this is the only shaft on the property, no other, I believe, being contemplated at present, a brattice wall is being carried down to overcome the difficulty of ventilation when developing and stoping commence. An excellent job is being made of this with pitch pine boards 1½ inch, tongued and grooved. The effect even now is highly satisfactory, all smoke and gas being out a quarter of an hour or twenty minutes after blasting.

An ideal method and gear for the sinking of future deep level vertical shafts I submit as follows: First, the permanent steel or wooden headgear to be used should be erected on suitable foundations. The first 100 to 150 feet of sinking would of necessity be slow, until the solid formation is properly entered. A few feet more according to its nature should be excavated in this, and the collar set definitely placed in position, and the first bearer set fixed in deeply seated hitches in the solid at the bottom, and the timber from the collar set to the bearers hung, close-lagged and blocked up.

One of the most important matters to my mind coming next is the tamping in of 20 to 30 feet good solid clay directly above the first set of bearers, and this should stop all surface water entering the shaft. In the meantime the permanent winding engines should have been laid down to be used in future sinking operations; and then we come to a vital question, whether skips or buckets are to be used. I think every one will agree with me in deciding at once for the former. They undoubtedly afford greater safety, quicker hauling, and better facilities for helping the pumps with the water, and I can confidently affirm that 20 feet more a month can be done with skips. The second and fourth compartments should be used for hauling, the first for a winch if necessary, the third kept idle, and the fifth for ladders, air and pump mains. The method of sinking will greatly depend on the quantity of water encountered. For a dry shaft hand labor, I believe, is the quickest, cheapest, and generally the most suitable. For a system, that employed at the Jupiter is excellent, but I would suggest the blasting of some of the end and side holes first, as I have found that the sump and easers will blast better and break more effectively when slightly loaded with the ground from the blasting of these holes. When water enters into the question I am sure machines will sink faster, as it is no longer possible to sink in benches.

Another matter which causes great difference of opinion is the number of machines which can be successfully and economically employed in a shaft of this size. The various experiments tried at the Village Deep make me a strong advocate of twelve. Over a period of a month we found a net gain of one hour per shift in the time of drilling by using twelve



Distribution of Drill Holes in Shaft on the Rand.

means of sinking, but to obtain a footage anything like the Jupiter it would be necessary to have picked hammer boys or Chinamen, and also fairly good ground and no water.

The sinking of vertical shafts by machines has many different phases, and my purpose is to try and strike an ideal system, in the hope that it may lead to beneficial discussion. Many different methods have been employed with varying success, and it will be best to take actual cases to demonstrate these.

The equipment of the South Nourse shaft is probably the best in use here to-day, their permanent winding engines and headgears having been erected. The engines are 1000 H. P. Whiting hoists, equipped with drums. The size of the shafts is 32x8 feet, divided into five compartments, three of which (the two end and center ones) are not used for hauling ground. The remaining two, Nos. 2 and 4, are fitted with 2-ton self-tipping skips, with steel shoes on wooden runners. One end compartment is used for pumps, air main, and ladder way, and the center one, being kept entirely free, greatly adds to the convenience of timbering, since it can always be staged.

Sinking operations are conducted as follows: Six small machines of 2½-inch diameter, on six bars, are in use, each tended by one white miner, with native or Chinese helpers. Forty to fifty holes from 4 to 5 feet in depth are drilled over the bottom of the shaft, their position, of course, depending on the state of the ground to be broken. These are then blasted, and cleaning begins as soon after as possible, the first skip of ground being hauled in from thirty to forty-five minutes. From ten to fourteen muckers are employed per shift, which varies in duration with the ground broken, but two shifts are usually sufficient for each round. The timber is similar to that ordinarily used in deep level shafts, viz., wall plates, dividers, end plates and studdles. The wall plates are mortised to receive the studdles and dividers, each divider effectually blocking two studdles at each end. The sets are blocked in the ordinary way with the sides of the shaft. The use of skips necessitates the timber being kept within 30 feet, or thereabouts, of the bottom of the shaft. The bottom wall plates are cleated with sheet iron to protect them against the blasting, but these are capable of rapid adjustment and removal.

Two sets of wall plates are lowered in quick succession beneath the skips, and the hanging is operated from the last blocked set and the bottom of the shaft. The runners (guides) are kept as close as possible to the bottom set in position, and below this temporary runners in 6-foot lengths are used, thus allowing the skips to reach the bottom without the shoes leaving the runners. Bearers are placed at

a half generally elapsed before the first bucket of ground was hauled. Eighteen muckers were employed per shift, and three shifts per round.

When the 4 feet referred to was cleaned up, the sumps of the old holes from the first blast were cleaned out by compressed air, and all charged again and blasted, after which similar cleaning operations were proceeded with. The average depth per round cleaned during October was 7.5 feet, twenty such rounds being drilled, blasted and cleaned up during the month. The average time per round during the month was 37.4 hours, 4200 tons of ground were hauled, and 0.96 pound of dynamite was used per ton of ground hauled. In all, 150 feet was sunk and timbered during October.

The Village Deep shaft was laid out to consist of a pump and ladderway compartment 6 feet 6 inches by 6 feet 6 inches, and four hoisting compartments 5 feet by 6 feet 6 inches inside timbers. The timber consisted of the usual wall plates 30 feet 4 inches by 9 inches by 9 inches, end plates 8 feet by 9 inches by 9 inches, sets 6 feet vertical centers, corner studdles 8 inches by 8 inches, other studdles 9 inches by 6 inches, and dividers 9 inches by 7 inches. All timber was pitch pine.

Owing to three center compartments being used for hauling, the blocking and fixing of dividers in position had mostly to be done while drilling operations were going on. Thirty feet of wall plates were hung on each side at a time—that is, ten wall plates were hung in succession. All wall plates were suspended from the rope of the center compartment (the bucket being first removed), lowered and swung in position by a rope at each end, and hung on four 1½-inch hanging bolts from the set above. The actual hanging of wall plates seems at first a difficult and dangerous operation, but with skilled timbermen great speed is attained, the average time per wall plate being five minutes. The hanging of the wall plates was always arranged to take place after the second blast, for the machines, bars and gear for drilling were lowered before the second cleanup was actually finished. The blocking of the sets, and placing studdles and dividers in position followed as soon as possible, and as the last timber set was completed, new wall plates were lowered. Wooden runners 8 inches by 4 inches in 30-foot lengths were used in the three winding compartments and were kept as close as possible to the bottom of the timbers. Sets of six single bearers were placed in suitable positions, at fairly regular intervals, of 80 feet, in deeply seated hitches, the end bearers being 14 inches by 9 inches, and the center 14 inches by 7 inches.

These being in position and sets blocked, the hanging bolts above the bearers were taken out. The timber was on an average 60 feet from the



machines instead of eight. Six white miners and twenty-four native helpers can successfully manipulate these and the plan of drilling should be somewhat as follows:

Holes Nos. 5, 13, 15, 22, 24, 32, may often be dispensed with, but that will entirely depend on the ground to be broken. In elevation the sumps of holes 16, 17, 18, should practically reach sumps of holes 19, 20, 21, and the sump of a hole such as 14 should be within 3 feet of the sump 17. If this is carried out no trouble will be experienced as regards blasting the timber. The blasting, cleaning, and timbering cannot be bettered at Village Deep. In almost all deep level mines of to-day water will probably be met with, if not in the shaft, in the future mining operations, and I would advocate at the time of sinking a Cornish pump being carried down as sinking operations are extended. The size of the pump would depend on the quantity of water estimated by the surrounding conditions and data from outcrop mines. It will be necessary to cut sumps about 300 feet vertically, and place balance bobs about every 500 feet. In conjunction with this pump a sinking pump of sufficient size to deal with the water encountered would be carried down with the sinking.

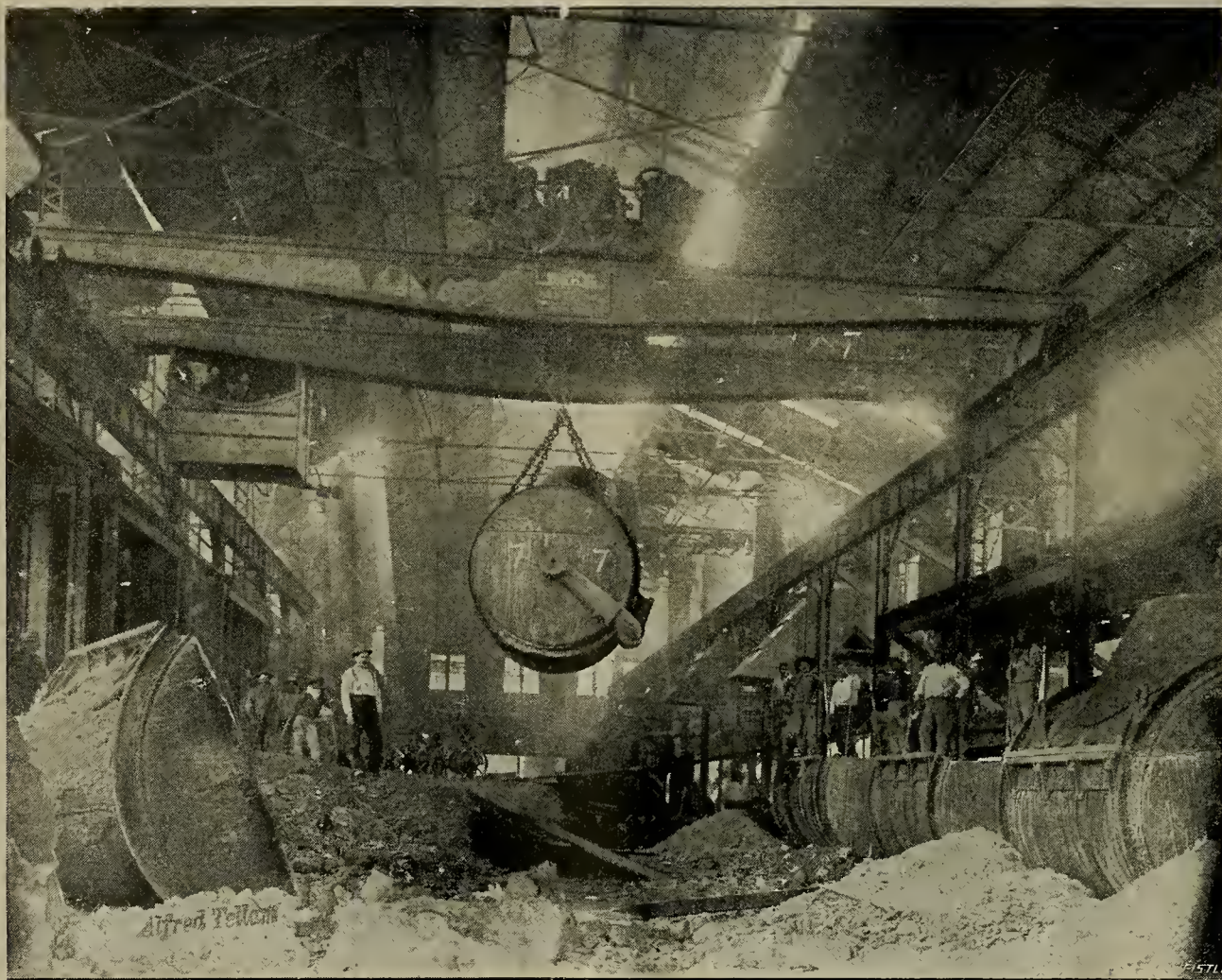
The lighting of a sinking shaft should be done as at

### The Bessemerizing of Copper Mattes.

Sulphide copper ores were concentrated into mattes for many years before the refining of the matte was undertaken in converters. Metallurgists had already conceived the idea of desulphurizing mattes by blowing air into the molten mass long before Mr. Bessemer's idea became a success. The conversion of mattes was first suggested in 1866 in Germany. In the same year a patent was taken out in the United States to convert copper matte by the Bessemer process of steel making. In the early experiments there was no trouble with the process until a large percentage of sulphur was oxidized and copper began to separate, when the tuyeres became clogged. Improvements were made, and step by step the process was perfected. It is stated that the Japanese metallurgists have for centuries made a good grade of copper in two operations—first, smelting to matte; second, blowing to a good grade of copper in a converter. This process is described in a report of the Director of the Mining Bureau of Japan, issued 1893. As the success of the idea developed, the necessary changes were made in the form and size of converters. The air was introduced at a higher point in the side through a hollow trun-

and protects the matte, may explain the anomaly.

Though it is difficult to see why finely divided silica ascending through the charge should not be attacked in preference to silica embedded in the lining, nevertheless results of experiments prove that the silica, whose specific gravity is so much less than that of the matte, does in great measure escape unaltered, and that the lining is the only economical menstruum for its supply. The practice has generally been to make the lining as siliceous as possible, using a pure quartz or quartzite mixed with only clay sufficient to make a plastic mass capable of being hand-moulded into lumps, which are generally pounded, also by hand, into the converter. Where the lining is not mechanically pressed into the converters, and the grade of the matte not above 50%, about one-half, often somewhat more, of the weight of lining is consumed to the weight of copper pigs made. At the Great Falls plant the lining is mechanically pounded into place by a steel tamper around a steel templet, which is expanded by a wedge while the lining is being inserted, and can be made to collapse sufficiently for extraction by the removal of the wedge after the lining is thoroughly set. The converter during the tamping rests on a revolving table. In this way the mass is more uniformly compacted, leakage of blast between the lining and the shell, or through



Copper Converters at Cananea, Mexico.

Cinderella and Village Deeps—that is, by two clusters of electric lamps 32 C. P., four to six lamps in each cluster, and suspended from the timbers.

I do not care for ventilating pipes, but would rather have a brattice wall as put in at Cinderella Deep. The cost of such is approximately 10s. per foot.

The matter of comparing costs of different shafts is a very difficult one, owing to the many diverse ways in which the various items of expenditure are grouped, and I cannot remember having ever come across the costs of two shafts which had been kept in exactly the same way, and gave the same information. The cost of a shaft sunk by hand should be somewhere in the region of £20 and by machines about £30 per foot, but these figures must naturally vary very much, as the whole matter practically depends on what amount of water has to be dealt with.

THE discovery of a vein or ore deposit gives the discoverer no right to the mineral so discovered if no steps are taken to appropriate the same as required by law. The reverse is often the case—that is, the locator claims ground and stakes it before a bona fide discovery has actually been made. In some instances this is done from necessity, as in a case where the mineral is buried under debris or a later geological formation.

nion instead of at the bottom. A wind box was provided through which the tuyeres could be punched and kept clear. The several steps in blowing matte into metallic copper are as follows: The lining of the converter with silica and clay. This is done to protect the walls of the converter, and also to supply the necessary silica to combine with the iron to aid in the operation. Charging the converter from the blast furnace. First blow, followed by skimming of the charge; second blow, with frequent punching; final skimming; pouring of the separated metal; repairing the lining; disposal of the slag.

As no practical method has been devised for adding silica to the charge, except through the medium of the lining, the constitution of the lining and the mode of building it into the shell are matters of extreme importance. Attempts have been made to blow the silica into the charge through the tuyeres, and to satisfy the matte by throwing it as lumps into the converter mouth; but apart from mechanical difficulties attending these methods, the silica remains too short a time in contact with the matte to permit of its combination with the oxidized iron, and therefore, whether added in powder or in coarse particles, most of it is found floating, unaltered, in the slag. The violent agitation of the converter's contents, and the rapidity with which the reactions take place, and the large body of slag which is almost immediately formed

the porous lining, is minimized, a larger amount of material is compressed into a given space, and the surface is smoother and less liable to abrasion than in the hand-made lining. As a result, a single lining lasts more than twice as many charges than when it is hand-laid, which is partly due, however, to its greater thickness. Usually with a 45% to 50% matte not more than four charges can be tapped to a lining, and between each charge more or less patching is done through the mouth of the converter. The patching can be more easily effected in the shallow trough or barrel converter than in the deep vertical shell. It has been found, however, that a much more basic lining can be used without retarding the final reduction to metal, and that the presence of copper is not detrimental.

The accompanying illustration is that of the converting plant at Cananea, Mexico.

The actual business of blowing a charge of matte is one requiring skill and experience on the part of the operator, who is known as the skimmer. The art can be learned only by actual practice. The attendant must learn to determine the condition of the charge by the color of the flames at the nose of the converter. The first blow usually lasts from forty to sixty minutes, sometimes longer. In the first stages the color of the flame is green, with tinges of yellow. Later the flames assume a greenish blue, and finally



a blue color, if the blowing be continued. At this stage the converter is turned down and blowing discontinued, or the entire contents of the converter is likely to be blown out and scattered over the workmen and the building. This is caused by the rapid formation of a large volume of sulphurous gas. It is frequently necessary to skim the charge twice in order to remove the slag formed, and thus relieve the burden on the blast. The men in charge of converters become very expert and careful in the work and seldom overflow a charge, for in such unfortunate event they not only are in danger of reprimand from the superintendent, but are subjected to the ridicule of their associates.

### Jeffrey Endless Trough Conveyor.

Two illustrations are given herewith of the Jeffrey endless traveling trough conveyor at the mines of the



Prospective View of the Jeffrey Conveyor.

Big Sandy Coal & Coke Co., Marytown, W. Va. The conveyor travels 155 feet on an angle of  $37\frac{1}{2}^\circ$ ; for 87 feet at an angle of  $32^\circ$ , and 176 feet horizontally, describing a curve when it runs from the incline to the horizontal. The conveyor is 42 inches wide, 8



Jeffrey Conveyor at Big Sandy C. & C. Co., Marytown, W. Va.\*

inches deep, and travels at the rate of 100 feet per minute. When fed continually it has a capacity of 3000 tons per day.

It is constructed of two strands of 18-inch pitch steel thimble roller chain, provided with self-oiling flanged rollers, the chain having attachments at one

side to which double-beaded or corrugated plates are bolted. These plates are provided with corrugations something on the order of corrugated roofing.

The corrugations overlap each other at the joints, forming a tight apron or belt, which will not open in any position, whether traveling horizontally or on a curve, or around the wheels at the end. To prevent the coal falling off at the sides, end or side pieces are provided which are 8 inches high and overlap each other, shingle fashion; thus it will be seen that we have a traveling trough that carries the coal without friction. Furthermore, the conveyor, being on rollers, will operate with a minimum of friction, wear and consumption of power. The coal is delivered to the conveyor at the top, from a bin, the conveyor acting as an automatic feeder, so that no special feeding device is required. It discharges its load at the bottom onto a set of screens for loading into railroad cars.

### Precipitation of Gold and Silver From Cyanide Solutions.\*

NUMBER II.

Written by W. J. SHARWOOD.

The Siemens-Halske process consists in precipitating the gold and silver by the electric current, the solution being passed in a continuous stream through a large tank divided into several compartments, each of which contains a number of large sheets of metal forming the electrodes. Originally the anodes were of sheet iron, and the cathodes on which the gold deposited were of thin sheet lead. When a sufficient amount of metal had collected the lead sheets were melted and refined. The more recent plan is to have the anodes of lead coated with lead peroxide (which is not attacked by cyanide as the iron was), and the cathodes of tinned iron. The gold deposits on this in a finely divided condition and collects in the bottom of the tank, from which it is removed at intervals, the metal sheets being permanent. From 6% to 12% of the theoretical precipitating efficiency of the current is said to be obtained in practice.

The electrolytic system has the advantage of precipitating copper out of the solution, and as each pound of copper keeps from three to four pounds of cyanide in an inactive condition, as regards dissolving gold or silver, the removal of this metal regenerates a considerable amount of the cyanide.

Precipitation with aluminum removes gold and silver, but the metal has a tendency to oxidize, is more expensive than zinc and has not come into practical use.

Precipitation with sodium, in the form of amalgam, has several theoretical advantages over zinc. When the sodium replaces the gold in the solutions it regenerates the cyanide, a certain amount of caustic soda is also formed which helps to keep up the alkali in the solution. The difficulty in using it appears to be mainly in getting a sufficiently large surface of sodium amalgam in contact with the solution, when large tonnages of solution are to be precipitated. The amalgam may be made by addition of metallic sodium, or more cheaply by electrolyzing common salt or sodium carbonate with a mercury cathode.

Zinc shavings have been and continue to be used at most plants, the solution running in a continuous stream through the boxes containing them. On the whole they have proved satisfactory, when the attempt has not been made to crowd too much solution

rule the latter condition is prevented by having more free cyanide or free alkali present, and dipping the shavings into lead acetate before use gives them a coating of lead which sets up galvanic action and aids precipitation.

The use of zinc dust or zinc fume has not, I believe, so far been introduced at any of the California mills operating cyanide plants. It is, however, employed at several of the largest plants in other Western States. Zinc dust or fume is a product obtained in reducing zinc from its ores; as the metal is distilled from the retorts, a certain proportion condenses in the form of a powder consisting of very minute globules of metal coated with oxide. Owing to the fineness of its particles, this material exposes a very large surface and is well adapted for use as a precipitating agent. The method of employing it at the larger plants is to collect the solution flowing from the sand vats in two or more tanks; when one of these is full it is agitated for a few minutes, and a suitable quantity of the dust is introduced, either by scattering it in a dry form on the surface or spraying it in as an emulsion; the mixture is then forced by a pump through a filter press, from which the barren liquid flows to the storage tanks, while the precipitated metals and any excess of zinc are retained in the press until the cleanup. The percentage of cyanide having been determined before precipitating, the proper weight of cyanide to bring a tankful up to working strength can be calculated and placed in the launder leading from the press, where it is dissolved by the flowing solution. The zinc dust and precipitate form a porous mass, which offers very little resistance to the passage of solution, and the pressure in the press is very slight if the liquors precipitated are clear, so that the chambers or frames may be proportioned to form cakes several inches thick. If, however, the solutions carry suspended slime, such as sometimes forms when solutions differing greatly in alkalinity are allowed to mix, there is a tendency to clog the filter cloths and increase the pressure on the pump, which may rise under extreme conditions to thirty pounds or more per square inch. Any suitable form of force pump may be used, such as a direct-acting steam pump of the duplex type, or a belt driven pump of two or more cylinders so as to give a uniform flow of solution. Any tendency of the precipitate to clog the cylinders is prevented by washing them out with a little clear solution after each pumping.

As the solutions have to be pumped up to the storage tanks, whatever method of precipitation is adopted, there is not a very great increase with this system in the power required; for instance, if the average pressure in the press is as high as ten pounds per square inch, this is equivalent to pumping the solution 23 feet higher; on the other hand, the fall due to the "gold tanks" and zinc boxes of an ordinary plant is saved, say, 8 to 10 feet, which makes only 13 to 15 feet average head in excess of what would be required with a zinc shaving plant, as the precipitating tanks take the place of the "sumps" and all intermediate tanks are omitted.

From one-sixth to one-third pound of zinc dust is used per ton of solution, while about six tons per hour can be passed through every hundred square feet of filter cloth in the press. In some plants the coarser portion of the zinc and precipitate is allowed to settle at the bottom of the precipitating vat and accumulate until the cleanup. In others it is stirred up when the tank has been pumped nearly empty, so that all is collected in the press. The latter practice seems to be the better, as, while the greater part of the gold is precipitated by simply stirring while the dust is suspended, precipitation is completed while the solution is filtering through the undissolved zinc in the chambers of the press. For this reason it is also usual to add a larger proportion of zinc in the first few tanks pumped after a cleanup. At the end of a run, lasting from two weeks to two months, the contents of the press are washed by pumping a little water, partially dried by blowing air through them and then removed. Most of the cake falls out readily when the press is opened and the frames moved. At this stage the product usually carries about one-third its weight of water. Its composition does not differ materially from that of zinc shavings precipitate, and it may be refined in the same way. It is, however, more uniform, owing to the absence of threads of "short zinc." The blowing operation oxidizes some of the undissolved zinc and sometimes causes the presses to become warm. During precipitation a certain amount of hydrogen is evolved, and its formation continues slowly, while the precipitate stands in a moist state. Care must, therefore, be taken to bring no naked lights near when inspecting valves, etc., at the time of the cleanup.

Zinc dust is shipped in drums and barrels holding from 800 to 1600 pounds. The price is lower than that of cut shavings and slightly higher than that of sheet zinc. It is not uniform in composition, but generally contains over 90% of metallic zinc. The presence of a small percentage of lead has been found very advantageous in effecting thorough precipitation. The fineness of division also varies, but in good samples over 95% will pass a screen of 200 meshes to the linear inch, while most of the particles are shown by the microscope to be not over  $\frac{1}{1000}$  inch in diameter.

(TO BE CONTINUED.)

\* Abstract Trans. Cal. Min. Assn.

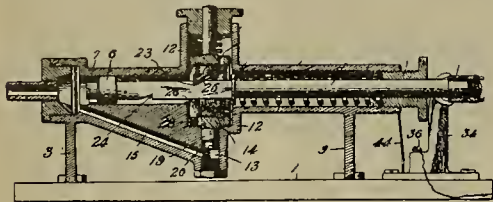


## Mining and Metallurgical Patents.

PATENTS ISSUED APRIL 25, 1905.

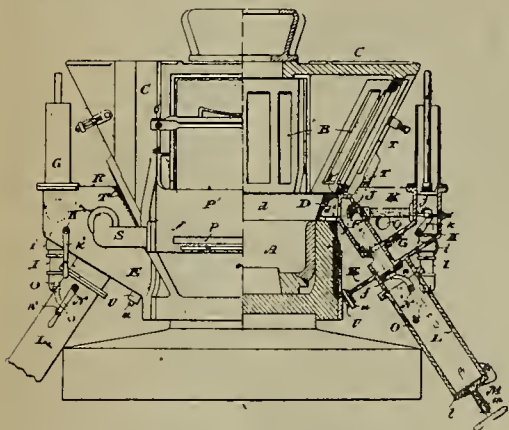
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

CONTROLLER FOR PNEUMATIC COMPRESSORS.—No. 787,489; B. F. Bergh, New York, N. Y.



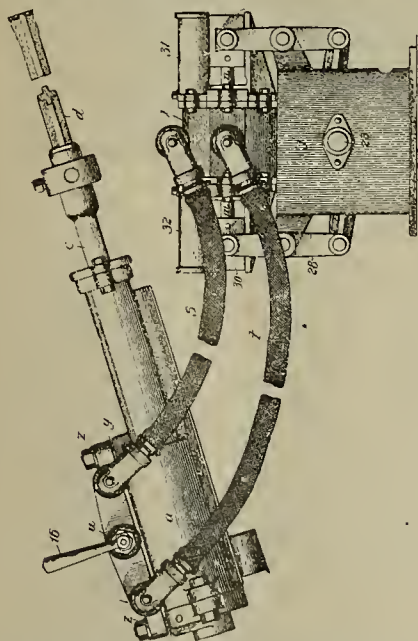
In pneumatic pump controller, combination of motor-controlling vibratory member subjected to reservoir pressure, single spring opposing pressure, means normally restraining member against movement under reservoir pressure, and releasing device for means and actuated by reservoir pressure of pre-determined degree whereby vibratory member is actuated by difference in pressure between that of reservoir pressure and spring pressure.

ORE CRUSHER.—No. 787,604; F. E. Woodbury, Milwaukee, Wis.



Combination with ore crusher comprising receptacle in which ore is crushed, means for crushing ore and grate through which pulp is discharged, of catch box having opening into receptacle inside of grate, opening below provided with screen, and means for producing upward pulsating current of water through screen and catch box into receptacle.

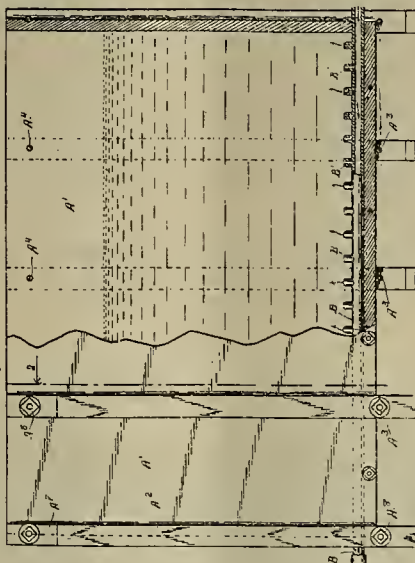
PNEUMATICALLY ACTUATED TOOL.—No. 787,961; R. Temple, Denver, Colo.



Mechanisms of class described, combination of pulsating engine cylinder, piston mechanism movably mounted therein, tool cylinder, piston mechanism reciprocatingly mounted therein and dividing tool cylinder into two chambers, tubular mechanism connecting chambers of tool cylinder and pulsating engine cylinder together, passage connecting both chambers

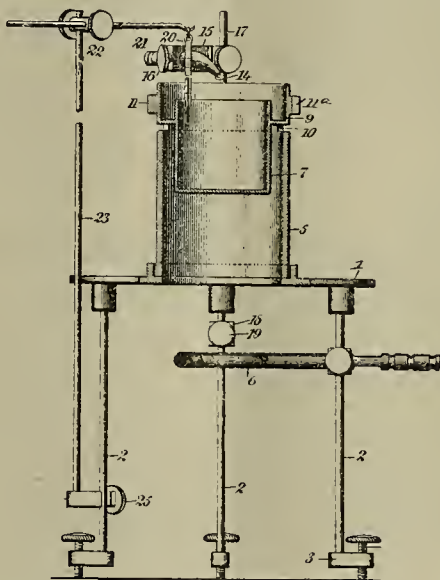
of tool cylinder together, check valve mechanism in such passage, and manually operable controlling valve for throwing check valve mechanism into and out of operative position.

LEACHING APPARATUS.—No. 787,902; C. E. Dewey, Denver, Colo.



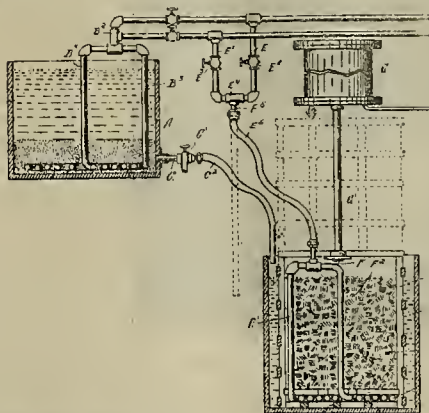
In leaching apparatus, combination of tank V-shaped in cross-section, and lead conduit located in bottom of tank and provided with vertically disposed orificed nozzles, nozzles being of sufficient length to cause fluid introduced into conduit to be carried upwardly into tank in vertical jets or streams.

FLASH TESTER.—No. 788,250; F. A. Courtois, Newark, N. J.



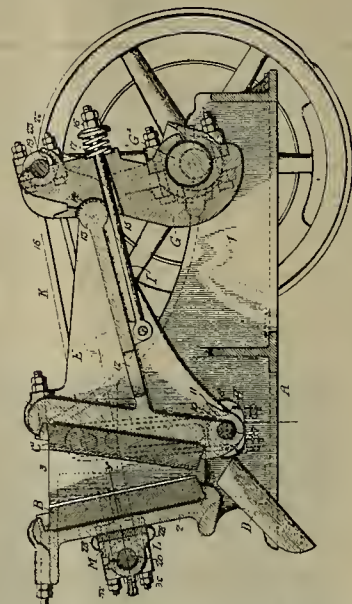
Flash tester comprising support, heater arranged underneath support, flue on support, test cup removably placed in flue and having trough around upper portion, burner tip for extending over test cup, and thermometer support.

PRECIPITATION PROCESS.—No. 788,443; G. H. Waterbury, Denver, Colo.



Process of precipitating copper in solution, consisting in placing solution in tank or receptacle containing pieces of aluminum of shape to allow solution to pass readily therethrough, and introducing air and steam simultaneously for agitating purposes.

CRUSHING MACHINE.—No. 788,207; T. J. Gray, Chicago, Ill.



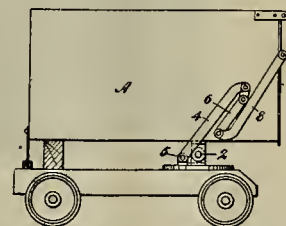
Crushing machine comprising stationary jaw; reciprocating jaw having rearwardly extending arm rigid therewith; pair of swinging links H pivotally supported at upper ends and attached at lower ends to transverse shaft 7 upon which reciprocating jaw is pivotally supported; pitman with which arm of reciprocating jaw has jointed connection; pair of swinging tension rods having jointed connection with pitman and tied to swing about axis forward of reciprocating crushing jaw; and spring tension rod providing yielding spring connection between pitman and reciprocating crushing jaw and arranged parallel or substantially parallel with right line extending forward from connection between jaw arm and pitman and intersecting reciprocating jaw at point between axis of pivot shaft 7 and axis about which suspending links swing, connection between jaw arm and pitman being at point between axis of pivotal or jointed connection between tension rods K and pitman, and axis about which pitman operates.

COMBINED DREDGER AND MINING SLUICE.—No. 788,211; C. H. Lewis, Baltimore, Md.



Dredger and mining sluice, which comprises rotatable vessel provided at or near forward end, with series of angularly placed and projecting scoops in communication with interior of vessel, and having at rear end outlet opening, together with appliances whereby device may be drawn along bed of sand beneath water.

DUMPING CAR.—No. 788,096; A. W. Dahmer, Sonora, Cal.



Opening, closing and locking device for door of dumping cars, device comprising lever fulcrumed to side of car so as to provide long and short arm, link connecting long arm of lever with hinged door, and a second link connecting short arm of lever with fulcrum fixed with relation to car.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Dr. J. H. Pratt's annual report to the United States Geological Survey on the production of asbestos shows that the principal changes to be noted in the asbestos industry at the close of 1904 were the increase in the production in the United States of the amphibole variety, the development of the Grand Canyon chrysotile asbestos deposits and the increase in the demand for the chrysotile variety. The many new uses which have been devised for chrysotile asbestos have created a demand for it that is now in excess of the supply. The high price which can be obtained for the chrysotile asbestos when it is in fibers of sufficient length for spinning permits the mining of this mineral in some places where the cost of mining would become prohibitory with any material decrease in price. G. F. Sevor of New York City, for the Keashey & Mattison Co., has made tests on asbestos building lumber and magnesite building lumber and shows conclusively that both these materials are superior to wood for the purposes for which they are manufactured, but that the asbestos lumber is much better than the magnesite. Such asbestos lumber, when employed in the construction of street railway and standard railway cars, for covering the end framing, should prevent the cars from taking fire by any derangement of the electrical apparatus. Another type of asbestos building material that is beginning to be extensively used is asbestos board or sheathing for roofing and for side walls. An asbestos shingle recently patented by Messrs. Keashey and Mattison is composed of asbestos fiber and hydraulic cement. These shingles are much stronger than slate and lighter in weight. They are made in three colors—gray, slate and tile red—in squares  $\frac{1}{2}$  inches on a side, with two corners of the square truncated. Nearly all of the asbestos mined in the United States is of the amphibole variety, which is obtained from near New Hartford, Conn., from Sall mountain, Georgia, and from near Bedford City, Bedford county, Va. Small quantities of chrysotile asbestos have been mined at Dalton, Mass., and in the Grand Canyon, Ariz. No new deposits were reported in 1904, and all the mining and development work was confined to the known localities. The production of asbestos in the United States in 1904 was considerably in excess of that of 1903, and was obtained principally from the deposits in Georgia and Virginia, a small amount coming from Massachusetts. The total quantity amounted to 1480 short tons, valued at \$25,740, an average value of about \$17.40 per ton. This production is an increase of 593 tons in quantity and of \$8980 in value, as compared with that of 1903, which amounted to 887 short tons, valued at \$16,760.

### ALASKA.

Navigation between lower Lebarge and Dawson opened May 1, when a large scow left Lebarge for Dawson with freight. The scow will follow the outgoing ice down the river to Klondike. The ice is still firm on Lake Lebarge and many outfits of seasonal merchandise are being hurried across the lake to reach Dawson ahead of the freight shipped from White Horse. Vessels cannot run from White Horse until Lebarge opens, which will be about June 1.

Prospective building of the Alaska-Perseverance's big stamp mill in Silver Bow basin has had a stimulating influence upon mining in this district. It is said that but 100 stamps are to be erected at once, and that 200 will be added at a later date. A crosscut has been driven 2500 feet from a level above the sea and  $\frac{3}{4}$  miles from the shore, attaining a vertical depth of 1500 feet. No raise has been made through to the surface. It is said that the last 1400 feet of the crosscut is in a mineralized body of low-grade milling rock. On Douglas island the lode has been opened to a depth of more than 1000 feet, and has been mined along its course for considerable distance. In the glory hole workings there has been removed one block of ore 1500 feet long by 500 feet wide, and the glory hole is now down 250 to 300 feet.

### ARIZONA.

#### Gila County.

Adolph Lund of Chicago, representing the purchasers of the United States group of claims on the west side of Pinal creek, near Globe, has given contract for sinking the three-compartment shaft 100 feet farther. He expects to put in a hoisting plant.

#### Mohave County.

At Cerbat the St. Louis tunnel is in 250 feet.—The Tennessee and Schuykill mines at Chloride are to be unwatered.—E. S. Osborne of Bill Williams Fork reports a large force at work on his Mineral Dome group of mines. The new railroad from Congress has reached Cunningham Pass, 20 miles east of the Mineral Dome properties, and track is being laid at the rate of  $\frac{1}{4}$  mile daily. The survey runs within a few hundred yards of the property and it is expected to be completed to that point before the first of June.—F. Dunham has bonded the Fay property, south of Kingman.

#### Pinal County.

Sinking has been resumed at the Buckeye shaft of the Troy-Manhattan M. Co. at Troy. It will be carried from the 200 to the 500-foot level.

#### Yavapai County.

At the Pickaway properties, Turkey creek, being worked by the Yavapai Development Co., E. A. Haggott, superintendent, twenty men are employed; the shaft is down 300 feet and will be sunk 700 feet before any drifting is done. A new road from Turkey creek to Richenbar has been built, over which supplies are being hauled. These supplies were formerly hauled from Mayer, 22 miles distant. The new haul is 12 miles.—At the Great Republic, Turkey creek, Superintendent

Sullivan has twelve men at work, has his shaft down 500 feet and is sinking to the 700-foot level.—Near Skull valley, M. Murphy has the El Dorado M. Co.'s shaft down 100 feet and will continue it to the 200-foot level.

It is reported that C. J. McNulty and G. Waddell have resumed work on the R. A. M. mines on Little Copper creek, 12 miles south of Prescott.

J. K. Millor is putting up a 3-stamp sampling mill on his property near Hillside, Ariz.

At the Sterling mine, Big Bug district, pumps are clearing the mine of accumulated water and development work will be taken up. The main shaft is down 410 feet and drifts have been run both ways on the ore.

The air drills have started up in the Senator tunnel, near Prescott, and three eight-hour shifts are at work.

A whim is being placed on the Rawhide group, in Grapevine district.

### CALIFORNIA.

#### Amador County.

The new hoist at the Zeile is almost finished. It is reported that the ore body is reaching into the Fleming ground, in which case a new shaft will be necessary.

Grading has been started at the Climax mine, east of Jackson, for a 10-stamp mill. The 2-stamp mill has been idle for some time, and no further crushing of ore will likely be done until the new mill gets in operation. The new stamps are to be of 1000 pounds.

#### Calaveras County.

The Turkey Gulch M. Co. plan to construct a gold dredger to be placed in the Calaveras river near Jenny Lind.—It is reported that the main shaft at the Gwin mine is to be sunk 200 feet deeper.

#### El Dorado County.

At the Lone Star mine, near Smith's Flat, the main tunnel is in 1300 feet.—Work at the Granite mine, Smith's Flat district, is in charge of Chas. Henson. A new hoist is being put up.—The North Weber Land & Mining Co. are preparing to put a hoist on their gravel property near Newtown. Work in the shaft will be resumed as soon as the machinery is in place.

#### Mariposa County.

S. L. Brown, manager of the Tennessee & California G. M. Co., has men at work at the Mallet mine on Bear creek, near Mariposa.

#### Mendocino County.

The Eel river coal mine, 6 miles from Covelo, is being opened up.

#### Mono County.

The Golden Gate mines, in Antelope valley, 60 miles southwest of Carson, Nev., have been bought by J. S. Parker, J. T. Borden, L. D. Folsom, J. E. Monroe, F. E. Fielding, J. E. Bray, P. Barnes, M. G. Womack and W. S. Wilhelm, all of Reno, Nev., who have incorporated as the Golden Gate M. Co. They intend to develop the property and place a modern mill upon it to mill the ore now blocked out.

#### Nevada County.

It is reported that a 4-stage centrifugal pump at the 2400-foot level of the North Star mine, near Grass Valley, is pumping 350 gallons per minute to a vertical height of 800 feet.—D. P. Stewart and Wm. Hogan have sold the Maryland quartz mine, above Washington, to the Sierra Madre Exploration Co. of San Francisco. Geo. Montgomery is interested. There is a 2-stamp mill on the mine and the ledge is worked by tunnel.—The Empire M. Co. of Grass Valley has granted the request of the Orleans and Sultana people and will continue selling water to both for milling purposes until they can establish a pipe line of their own. The Empire, which has been supplying the mines mentioned, will require all the water its own pipe line will carry, as it intends to operate steam pumps. Recently it gave notice that it could not supply water later than May 1. This action, had it been strictly adhered to, would have caused a complete shutdown on Oshorn hill.—The Orleans hoist, which has been run by water, will be changed so that an oil burner may be put in.

J. W. Phelps has bonded 800 acres in Penn Valley, 10 miles from Nevada City, and is having it prospected to see if it is suitable for dredging.

#### San Diego County.

Amblygonite, a lithia mineral, is found in quantity near Pala. All of the lepidolite produced in the United States for commercial purposes is obtained from the same neighborhood. There are two other localities in this country at which lepidolite has been found in considerable quantity, one near Banner and the other 7 miles east of Julian. No lepidolite was mined at either of these localities during 1904, and only the necessary assessment work was done. The greater part of the lepidolite that has been mined in this country has been exported, but nearly all of the spodumene has been utilized by home chemical manufacturers. There is an overproduction of lithium mineral for domestic consumption, and unless some new technical uses can be found for the lithium salts, such as use on a considerable scale for pyrotechnic purposes, there must be considerable decrease in both the demand for them and the price they bring. The quantity of lithium minerals produced in the United States during 1904 amounted to 577 short tons, valued at \$5155. This is a decrease of 578 short tons in quantity and of \$18,270 in value as compared with the production of 1155 short tons, valued at \$23,425, in 1903. Of this 1904 production the greater part was spodumene from South Dakota. Three different minerals are mined at the present time for their lithium contents—lepidolite and spodumene, both lithium silicates, and amblygonite, a lithium phosphate.

The Chula Vista Oil Co. is drilling for oil near Chula Vista, being down 1350 feet. M. J. Hermann is secretary.—At Julian the Los Angeles M. Co. are in 800 feet in the Warlock tunnel.

#### Sierra County.

J. H. Liddle has started work on the Wisconsin drift mine, near Forest City, in an effort to cut the channel.

#### Pumas County.

(Special Correspondence).—The Indian Valley mine, near Greenville, is opening up its tunnels preparatory to starting up the mill.—Dodge Bros. are putting three 5-stamp batteries on the Standard, near Greenville. The New York Mines Co. of Greenville is putting in an additional five stamps.

Greenville, May 1.

#### Shasta County.

J. T. Jensen has completed his 4-stamp mill on the Black Jack mine near Centerville.—J. Hulme intends to put in a 10-stamp mill and cyanide plant on the Crown Deep mine in the Lower Springs district, 3 miles west of Redding.—The owners of the Graham group of mines, B. A. Graham, P. F. Grant, H. Callaghan, J. D. Graham and W. Bassett, which are located on Horse mountain, in the Pittsburg mining district, midway between Copper City and Baird, have bonded the mines to P. Deidesheimer of San Francisco, Cal., for \$30,000.

#### Siskiyou County.

The Yreka Creek Gold Dredging Co. has commenced digging a basin for a new dredger at the Antone Foster place, on Yreka creek, 1 mile north of Yreka. The company will probably open up the Solus place above Hawkinsville at mouth of Yreka creek also, and fix up the old dredger for renewing operations. W. H. Estabrook is the superintending manager and W. L. Cooper has been employed as foreman.

#### Tuolumne County.

A duplex air compressor has been put in at the Souldy mine at Souldyville preparatory to sinking the shaft deeper.—It is reported that the 10-stamp mill of the Clio mine, near Jacksonville, has been temporarily closed.—The Santa Ysabel shaft, near Stent, is down 800 feet.—Pumping machinery has been put in at W. Lewis' Red Hill mine at Bald mountain preparatory to working.—Ore from the Sell mine, near Sonora, is being crushed in the Hope mill.—The Mohican mine, near Tuolumne, has been started after an enforced idleness of several weeks for lack of fuel.—Sinking has been resumed in the new Calico mine at Stent. The shaft will be sunk to a depth of 300 feet, when drifting will be started.—Work has been commenced on the Crescent mine on the South Fork of the Stanislaus river, owned by W. Prange and R. L. Potter.

### COLORADO.

(Special Correspondence).—The output in several of the mining districts of the State have been curtailed the past month owing to storms in the mountains and the bad condition of the roads leading to the different mines. In many places the roads are practically impassable owing to the heavy snow fall. This month will undoubtedly see a change for the better.—Governor McDonald has appointed A. W. Hogle, E. L. White and Eugene Grubb as a commission to represent Colorado at the Portland Exposition. Mr. White, who is commissioner of mines for Colorado, will have charge of the mining exhibit.—Several damage suits, aggregating thousands of dollars, have been filed in the Federal court by different mining and reduction companies against the Western Federation of Miners and its officials. These suits are the outcome of the strike in this State which was ordered by the Federation. The Federation officials and individual members of the order now have suits pending against ex-Governor Peabody and mine owners for damages for throwing some in jail and deporting others.—In Cripple Creek "high grading" has been carried on systematically in several of the high-grade mines, and it has been impossible to convict any one of the charges, even when they confessed to the crime of stealing the ore. One judge held some time ago that a miner taking the ore could not be convicted of stealing, as it was impossible to steal real estate. The latest report comes from Silverton, where they have caught several men with the ore in their possession. In some instances assayers act as a fence to dispose of the stolen ore. In places the men will be employed in one mine during the day and work in some other at night, for the sole purpose, it is stated by prominent mine operators, of high grading.—Injunction proceedings have been instituted in the United States Circuit Court against the Moffat road from entering or passing through Gore canyon, near Kremling, in Grand county. A company intending to use the canyon for an irrigating canal are the plaintiffs in the case.—The railroad from Sunset to Ward, in Boulder county, has resumed operations. This portion of the Colorado & Northwestern, operating out of Ward, has been abandoned for several months past on account of snow.

Denver, May 2.

#### Clear Creek County.

The 250-ton Newton annex mill, at Idaho Springs, has been started on the ores from the Gem mine. A 9x15 Blake crusher, two 14x26 rolls, four three-compartment and two two-compartment jigs, four Wilfley tables and three Wilfley slimers, and a full system of hydraulic sizers, classifying and settling tanks, have been added. The recrushing is done by a battery of 20 1000-pound rapid-drop stamps. The other section of the mill, which will be used for the concentration of ores which will run from eight to twelve tons into one, is equipped with 20 rapid-drop stamps crushing to 30-mesh, and three sets of Wilfley tables and slimers. Another section consists of ten slow-drop stamps, and has a complete equipment for amalgamation.—The 12th, 14th, 17th and 18th levels from the Gem shaft are being driven both east and west with machine drills, and it is largely the ore taken out in driving these levels which will keep the mill supplied for the present. The old Newton mill will treat custom ore. At present it is running almost entirely upon ores from the Sun and Moon mine.—The Alpine mill, at Idaho Springs, which has been lying idle for the past two months on account of legal entanglements, is said to have been started up on custom ores. It is understood that the mill will handle the entire output of the old Pewabic mine in Russell gulch, which will be shipped by way of the Gilpin tramway and the Colorado & Southern cars.—Lundstrom & Bue, leasing the Mint mine east of Empire, have found good smelting ore.—A good



strike is reported from the Ben Franklin on Silver mountain, belonging to F. Maxwell of Georgetown.

It is reported that parties are negotiating with the Aliunde Con. Co. of Georgetown for the privilege of handling the entire dump matter of the Equator, Ocean Wave and Marshall tunnels.

The upper Pay Rock tunnel, which is being driven to cut the Vulcan lode, near Georgetown, is expected to reach the vein during May. C. I. Burt, who holds the property under bond and lease, has charge.

It is stated that a new mill with a capacity of 100 tons daily will be erected at the base of Saxon mountain, near Georgetown, by the Anglo-Saxon M. & D. Co., which recently secured the Saxon Extension mine. A gravity tramway has been completed from the Saxon Extension tunnel to the base of the mountain, a distance of 800 feet, with a daily capacity of 100 tons. The mill will be amalgamation-concentration and is to have a cyanide annex. J. L. Crump of St. Paul, Minn., is secretary of the Anglo-Saxon Co. D. W. Shepard is manager at Georgetown. The property is being developed by tunnel.

#### Chaffee County.

The northern extension of the Dolomite group, near Newitt, 22 miles northeast of Buena Vista, is to be operated by the Tewen M. Co., who will put in machinery of sufficient capacity to insure rapid progress. A shaft will crosscut the ore shoot at an estimated depth of 300 feet.

#### Custer County.

The Fassett Brothers, who are developing the Walk-away, near Silver Cliff, expect to start shipping soon.—The Little Bernice Co. of Silver Cliff is shipping ore from the winze being sunk at the 280-foot level.

G. White of the P. & O. Co. has commenced driving the Brown tunnel, near Silver Cliff. The tunnel is in 150 feet, but will be widened and heightened. The ore in the higher workings is of a milling character.—The steam hoisting plant of the Robert E. Lee has been placed in the Invincible mine, near Silver Cliff, the shaft having been retimbered near the top of the collar, preparatory for more extensive work.—M. Moore and associates have a clear title to the California mine, near Silver Cliff, and will develop it.

#### Gilpin County.

(Special Correspondence).—Gilpin county still preserves the old method of measuring the loads of ore by the cord, which forty years ago was introduced for want of scales for weighing the ores, and for that reason they used the cord wood measure, or 128 cubic feet to the cord, holding eight tons of ore, more or less, according to the specific gravity. Most of the mills use the slow-drop stamps, plates and the humper for concentrating the ores of the district. Some of the mills are employing rapid-drop stamps. The milling industry has been retarded owing to the low treatment charges at the smelters, as the miners are able to ship direct to the smelters and get the full assay value of their ore. As a result of these low treatment charges being made by the smelters, some of the mills have closed down indefinitely and others have been obliged to close down a portion of their plant. Considerable ore is being shipped to the mills at Idaho Springs in Clear Creek county, owing perhaps to a better treatment charge that is being made at the Black Hawk mills. A large number of smaller properties are beginning to ship that heretofore were unable to make pay.—On Central City hill, J. B. Hafer & Co. are operating the Gregory No. 2. An adit is being driven on the vein. The company intend driving this tunnel 600 feet, which will give them 260 feet depth. The shaft on the Maine-Hamlet near by is down 400 feet and taking out ore. Drifting is being pushed in both directions from the shaft.—On Gregory hill, the Ontario-Colorado mine, H. Bowden, superintendent, has a shaft down 870 feet. This mine is producing thirty tons of mill dirt per day.—It is understood a number of the properties here are desirous of erecting their own reduction works, but are unable to secure a water supply sufficient to operate the mills.—A suit is pending between Central City and Black Hawk over the water supply of Nevada creek. Should Central City win the case, it is stated the mines in that vicinity would be in a position to secure water from the city. It is contended by Central City that the town of Black Hawk does not require the water for domestic purposes, while Central City is dependent on the stream for domestic use.—The Rocky Mountain concentrator, under the management of E. S. Moulton, has made some changes in the milling practice. Concentrators of their own design have been installed and they are doing good work. It is handling seventy tons of ore per day and is operated as a custom mill.—In Nevada gulch, A. M. Rucker is operating the Pozo. The ore is zinc, carrying some copper, gold and silver.—In the Russell Gulch district the Twolon M. Co. are hoisting twelve to fifteen tons of ore per day. The shaft is down 350 feet. Drifts are being run each direction on the vein from the shaft. J. H. Tuckfield is foreman.—The East Boston, between Central City and Black Hawk, is under the management of S. Hoskins. Drifts are being run to connect the Rialto and the East Boston—both properties being under one management. Wm. Job is superintendent of the East Boston Co.—The Hidden Treasure mill, under the management of W. J. Lewis, is operating twenty-five out of eighty-five stamps at present. Preparations are being made to operate fifty stamps, but on account of the condition of the roads they have been unable to get the ore.—The Old Town mine, in Russell gulch, which is developed to a depth of 1500 feet, is under the management of Geo. Kimball, Jr. This mine is now on a dividend-paying basis, and is fitted up with compressor, hoist, etc. The electric power is furnished by the electric company at Georgetown, 15 miles distant. Some of the ore from this mine is shipped to Idaho Springs for treatment in the mills at that point. A portion of the ore is treated in the mills at Black Hawk.

Central City, May 1.

The St. Louis 5-stamp mill in Lump gulch, near Gilpin, has been sold by G. D. Kaye of Boulder to Duffield et al. of Rollinsville, representing the Mountain Monarch M. Co. and Augustus & Sarchalotto of the Colorado property. A contract has been given to tear down the mill and equipment and set it up on the Mountain Mon-

arch millsite on Gambell gulch, in the Independent district, where it is proposed to double the capacity by putting in another battery of five stamps, bringing up the capacity to twenty-five tons per day. An independent company is to be formed for the operation of the mill. It will handle the product from the Mountain Monarch and Colorado properties, being connected with the latter by a tramway, which will be built at a later date.—Operations have been resumed at the Wood mine in Leavenworth gulch by Denison & Co., as lessees, and drifting work is being carried on in the 200-foot levels. As soon as the surface water abates the lessees intend to sink another lift in the main shaft so as to have ground for stoping purposes. They are figuring on the installation of a larger plant of machinery, including hoist and boiler. J. W. Cannon of Nevada is in charge.—Operations have been resumed at the New-foundland mine on Gunnell hill, west of Central City, by the Newfoundland G. & S. M. Co., with G. W. Mabee, Jr., as superintendent.

#### Gunnison County.

The Sunlight G. M. Co. has run its crosscut tunnel at Sherrod 200 feet. It is intended to cut the Golden Eagle at a depth of 400 feet. W. M. Bacon is secretary and treasurer.—It is reported that the Jersey Blue mill on Ohio creek has been started up.—A good strike is reported in the Raymond tunnel, near Ohio City, 1800 feet from the portal.—A. E. Reynolds, who recently took hold of the Gold Link group, a mile above the Raymond, is running another long tunnel, under the superintendency of J. F. Pearson. The tunnel is in nearly 1400 feet.

#### Hinsdale County.

J. A. Hunt has started work on the Silver Wedge tunnel,  $1\frac{1}{2}$  mile southeast of Lake City. It is in 400 feet and is to be continued 500 feet farther to intersect the Rob Roy shaft.

#### La Plata County.

(Special Correspondence).—The Empire M. Co., whose buildings were demolished by a snowslide in January, has opened the road to its property and has men at work building and repairing, and will resume operations on the crosscut tunnel as soon as buildings are up.—The new wagon road is being built from Durango to the Oro Fino district, where the Neglected and Durango Girl mines have heretofore been handicapped by the high cost of transportation. The Neglected is packing in supplies and will commence operations.—W. S. Bacon is at work near La Plata driving a crosscut tunnel to tap a large dike.—The Bonnie Girl at La Plata are finishing their 200-ton mill, which they expect to put in operation this season.—The May Day, near La Plata, has its wire ropeway in operation and is shipping twenty-five tons of high-grade ore per day. This mine has been equipped with electrical machinery to furnish lights and power for the Crane ore washer and small machinery, all of which is now in operation.—The Chief mine at La Plata has put in a gasoline engine and blower to ventilate the mine. The drift is in 400 feet; 300 more will be required to cut the vein.

La Plata, May 1.

#### Montezuma County.

(Special Correspondence).—All mining on the Mancos is at a standstill on account of the storms and snow in the higher mountains. Manager Franks, who was forced to close the Old Kentucky mine on account of lack of fuel, returned to Mancos recently to open the road and resume operations, but was forced by the late storms to delay the work and has returned to Cripple Creek for a month.—The old placer fields on the San Juan, 40 miles from Mancos, are being prospected with a view to the installation of dredgers.

Mancos, May 1.

#### San Juan County.

E. W. Walter, local manager for the Green Mountain M. & M. Co. at Silverton, expects the company's new 300-ton mill on the Green Mountain will be ready June 1. In the meantime the branch railroad from Howardsville to the millsite will be built and the mill equipment transported over the new line.—The Silverton Northern Railroad Co. are preparing to build a road up Cunningham gulch from their main line at Howardsville, and expect to have it running by July 1.

Manager W. R. Pyke of the Royal M. Co. has started men and machines on the Mazeppa drift and pushing work on the main drift in Sultan mountain, Silverton.—The new plant of the Hamlet M. Co. at Middleton is expected to be started by June 15.—A. A. Lamont, superintendent of the Yukon, or Uncle Sam property, on Cement creek, near Silverton, has been pushing work on the large vein recently cut by the crosscut tunnel.—The Kittimack M. Co., organized in Denver, to work the Minnie Gulch Co.'s mines, near Silverton, has had men doing assessment work on the claims and continuing development through two 900-foot tunnels that were run by the Minnie Gulch M. & T. Co., three years ago. The Kittimack Co. has secured a long term lease and bond from the principal stockholders of the Minnie Gulch M. & T. Co., and will operate in a systematic manner. F. S. Lavarack, superintendent for the Kittimack Co., will increase the present force to twenty-five or thirty.

Kunz & Hannum have started work on their Cashier-Dexter property, on Eureka mountain, near Silverton.—The Silver Lake mill, near Silverton, is to be changed by discarding Hallet tables and substituting No. 5 Wildcys. The change is considered by the management as desirable as regards close saving of the values in the ores, and it is said will involve the eight-hour day plan for the employees, irrespective of what department they are working in.—At Animas Forks on the Bagley tunnel, of the Frisco Mines Co., a combination air and electric drill is to be tried.

#### Summit County.

The Old Union M. & M. Co.'s main tunnel, near Breckenridge, above the millsite, makes an outlet for the ore now being mined from the stopes above it, and when connection is made with the upper workings on the top of Mineral hill, this tunnel will be the exit for all the mine products. The recent development in the mine tunnel has proved the existence of a ledge of ore 20 feet in width, all of which will pay to treat in the mill. This

tunnel will cut the shafts from the summit of Mineral hill at a depth of 450 feet. A. E. Keables is manager, G. C. Smith superintendent, F. Graham mill superintendent and D. H. Lawrence consulting engineer. The Union mill has been completed and Superintendent Graham has made trial runs and test crushings and concentrations on the company's ore. The mill is 70 feet wide, 130 feet long and 73 feet high.—The Detroit mine on Gibson hill is to be reopened by S. M. Perry of Denver and G. C. Smith of Breckenridge.—At Frisco the Mary Verna mine is shipping ore from its upper workings and the large development tunnel is being pushed ahead by three shifts.—The main tunnel of the North American mine is progressing rapidly. The company operating this and the Mary Verna mine, which are under the same management, are considering installing an air compressor midway between the two main tunnels, in order to run these in with machine drills.—At the Jessie mine the leasers are running their 40-stamp mill full capacity.

#### Teller County.

(Special Correspondence).—The Portland G. M. Co. did not appropriate the amount necessary to guarantee the drainage tunnel for the Cripple Creek district at a recent meeting. The Portland Co. has not refused to put up a reasonable amount, but they believe the amount assessed against them is more than they should pay. It is believed that later on, as soon as they can investigate thoroughly the condition of affairs, they will come forward with what they consider a fair proportion to the benefits they will receive from the tunnel if it is completed.

Cripple Creek, May 2.

F. M. Woods, general manager of the United Gold Mines Co., reports that the company will take over the W. P. H. property on Ironclad hill, Cripple Creek, and work and operate the mine on company account.

The Sundown mine of the H. H. H. Co. at Cripple Creek and the Dan McDonald adjoining are to be worked by H. W. Humphrey of Denver. The Sundown shaft is down 400 feet.—The Commonwealth M. & M. Co.'s Star drift, on the east slope of Beacon hill, is 100 feet from the shaft and is following a vein.—Superintendent Donahue, of the Co-operative Co., operating on the Rose Maud mine, Cripple Creek, is shipping regularly. During recent thaws the waters of Anaconda creek flooded the Rose Maud shaft, seeping through the embankment below the collar. It arose above the third level for considerable distance, drowning out the pump and forcing miners to the surface.—L. G. Henry, leasing the Peggy mine on Gold hill, Cripple Creek, has opened up high-grade ore at the 350-foot level.—Hower and associates are operating under lease the main workings of the Dante on Bull hill, Cripple Creek, and will commence sinking the shaft another 100 feet which, when completed, will give them a total depth of 650 feet.—Air drills and compressor, formerly operated on the Gold Hill tunnel, have been moved to the south end of the Gold Bond property, Cripple Creek.—Lessee Paul S. Penn and associates, who recently secured a lease on the Red Spruce mine on Gold hill, Cripple Creek, have started to crosscut from the bottom of the shaft at a depth of 360 feet.—On Battle mountain, Cripple Creek, the Granite G. M. Co. at a depth of 400 feet have opened a new ore body and another one at depth of 1000 feet through the main working shaft.—The Rose Nichol shaft on Battle mountain, Cripple Creek, has reached the 550-foot level, and prospecting drifts have been started.—On the Burns claim of the Acacia Company, the Exposition Mines & Leasing Co. has resumed sinking at a depth of 260 feet. Another lift of 100 feet will be added. To advance work with greater speed a heavier hoisting plant will be put in. The one arranged for is that formerly used in hoisting from the Wrockloff shaft, on another block of the same property.

## IDAHO.

#### Blaine County.

E. W. Packard and J. C. McChrystal of Salt Lake City, Utah, recommend a temporary suspension of operations below the 900-foot level of the Tiptop mine, near Hailey, while the upper levels are developed more thoroughly.—The Wood River Zinc Co. has started work in the Noy Aug group, in Panther gulch, near Hailey.

#### Boise County.

J. Fullard of the Mammoth mine, near Placerville, says the shaft is down 360 feet and will be sunk 400 feet and then a crosscut will be driven to the ledge.—J. H. Emery, president and manager of the Gold Coin M. Co., has men enlarging the Solomo ditch, on More creek, near Idaho City, to furnish water power for an electric plant to be put in to run the hoist and mill at the mine. The mill will be built the coming summer. Work will be resumed in the mine as soon as supplies can be hauled.

#### Latah County.

Superintendent J. W. Sherer of the White Cross mine on Moscow mountain, 8 miles from Moscow, reports a strike of high-grade ore. The 5-stamp mill is running steadily.

#### Shoshone County.

The Black Cloud mill, on Nine Mile creek, near Wallace, has started on ore from the Black Cloud mine.—Men are at work on the Panhandle mine, near Wallace, grading a site for the main working shaft.—The Success M. Co. has been formed by H. F. Samuels, J. L. Bailer, C. F. O. Merriam, J. J. Burch and A. H. Featherstone to work the Granite mine on Nine Mile. Plans are being drawn for a mill of 100 tons' daily capacity to extract the zinc values. The lower tunnel is 1200 feet in length and 418 feet below the old upper workings.—The Silver Star M. Co. of Wallace has let a contract to widen, straighten and timber its lower tunnel, and as soon as this work is accomplished another contract will be let to extend the tunnel 150 feet farther. It is calculated that this extension will bring the tunnel under the blowout and croppings on the surface. W. H. Batting is president and W. J. Bracking secretary.—The Idaho Free Press reports that jiggling operations on Canyon creek, near Wallace, are proving successful. The largest plant now at work is that owned by W. R.



Swicegood, D. L. Hoppins and J. Kelly at the No. 4 dump of the Standard mine. This plant was installed last fall and was in continuous operation until cold weather and a shortage of water compelled it to close down. It resumed operations two weeks ago, with three jigs being worked. —Bannister & Co. at Gom are working two jigs on the north bank of Canyon creek, below the outlet of the Hecla mill. —On the hill above the Hecla mill the Cook boys are working two jigs and four men on one of the old Gem mine dumps. —The jig at Granite has quit. —The two jigs at Frisco are idle, owing to the high water in the creek. —The two-jig plant at Upper Mace, below the O. R. & N. bridge, is temporarily idle. —A one-jig plant is being operated by W. R. Swicegood, G. Ehrenberg and J. Sleeper on one of the Helena & Frisco dumps. —Bannister & Co. have made arrangements to work the bed and banks of Canyon creek from below its junction with the main river from Mullao up to the outlet of the Standard and Mammoth mills.

According to the report of the management, 12,271 tons of ore were extracted from the Hercules mine at Wallace in 1904, giving a gross value of \$928,877, and a net profit of \$430,418. This record is made without a mill. The ore as mined is hauled 2 miles to the railroad and shipped in its crude form to the smelters. The owners have commenced building a 200-ton concentrator. —The Federal M. & S. Co.'s report for 1904 shows the net profits of the company's four mines in the Cœur d'Alenes to have been \$1,169,036. There were 672,669 tons of ore extracted, giving a gross value of \$4,760,181. The actual cost of extraction was \$1,994,434. The cost of transportation and reduction was \$1,525,424, while the cost of betterments was \$70,285, making a total expenditure of \$3,591,145.

#### Washington County.

President D. C. Nevin of the Iron Spring M. Co., at Iron Springs, has returned from the East, where he spent two months purchasing machinery for a 100-ton cyanide plant. —The Gold Coin mill at Black Lake has been temporarily shut down, owing to an accident. A drain tunnel 1000 feet long will be run in the mine to drain the workings.

### MISSOURI.

#### Jasper County.

(Special Correspondence). —Holmes, Capos & Rogers of Joplin have purchased the Old Hickory mill at Chitwood and are having it moved to Badger and Peacock valley. —W. E. Morgan of Joplin has a lease on the Dugan diggings on the Roh Roy land, 1 mile south of Villa Heights. —The Charter Oak M. & M. Co., of which J. E. Putnam of Joplin is manager, has resumed operations on the John Jackson land at Chitwood. —A. Scott and J. McCarthy of Joplin and R. A. Mooneyham of Carthage, owners of a prospect on the Granby land at Smelter hill, are figuring on building a mill. —H. Cavanaugh and others of Carterville have commenced work at the Dividend mine at Midway. —Prospectors are at work on the Mahaska land, adjoining the Empire M. Co.'s land at Joplin. —Gohar, Herron & Co. of Joplin are producing three tons of zinc and two tons of lead weekly from their mine west of Joplin. —Iona, Mich., parties have built a new 100-ton mill north of the Utopian M. Co.'s property under direction of J. A. Peck. —McClure, Jenkins & Goatley of Joplin, on the R. F. Poundstone land east of Oronogo, have their drill hole down 250 feet and have found rich ore. —Chapman & Lennon of Joplin, who recently commenced rebuilding a mill on the Reliance M. Co.'s land at Neck City, have the mill almost completed. —G. E. Moore of Monticello, Ill., and brother, A. L. Moore of Chicago, Ill., who recently secured a lease 6 miles north of Neosho, have opened up ore in the sheet ground at a depth of 120 feet and are now figuring on moving a mill to their land. —G. Brand and others of Neosho, who recently secured a lease on forty acres of the W. G. Wills land, near the old Mosely mines, north of Neosho, are now sinking a shaft.

Joplin, May 1.

#### Stone County.

The Hoho M. Co. have put up a steam hoist and pump on their new shaft near Baxter. —The Dark Horse mine, near Baxter, is working on good ore. Manager W. T. Apple and Superintendent Davidson will put in machinery for a concentrating plant. —At the M. K. & T., near Baxter, Superintendent D. McRuer has his elevator up, the crusher doing good work, the 4-inch pump throwing water nicely, six hand jigs running steadily, and good ore. —Scoles & Horning, who struck a deep run of ore at Galena, have their shaft down 75 feet and are building a new derrick preparatory to putting in a steam hoist. —Repairs are being made on the pumps at the Pittsburg No. 2 shaft at Galena. —J. Keys and others have a lease on the Oronogo mill, on the McCann lease, southwest of Galena, and are running on tailings.

### MONTANA.

#### Fergus County.

It is reported that the stamp mill at the Garnet G. M. Co.'s property near Pony has been started. —The Strawberry mill, near Pony, will probably be increased by ten more stamps, making twenty in all. The ten stamps are dropping on ore from the Clipper mine, on Mineral hill. —Operations will be resumed at the Watseca property, near Rochester, on the tailings of the new mill. —Near Maiden, G. Bellis is developing the Collar gulch property.

#### Granite County.

The iron and copper mine on Franklin hill, near Philpshurg, owned by E. Sifton, C. E. Moore and G. T. Cape, has been leased to W. Frost of Butte, representing a Butte company. The mine is near the Jackknife bend, on the Granite road, and has been opened up by several tunnels. Beside iron, the ore carries values in copper and is valuable for fluxing purposes. It is the intention to ship several carloads of ore per day to the Heinze smelter and the Butte Reduction Works at Butte.

#### Levi and Clarke County.

The Red Bird Co. of Helena is working the Reliance group, in High Ore gulch. High-grade ore has been

found in two places where levels are being run and a winze sunk. The company has men at work on the Red Bird, near Austin, making shipments. The incline will be extended another 100 feet from the 300-foot level, and a four-drill compressor and additional boilers are being put in.

#### Madison County.

It is reported that Superintendent J. H. Pankey has started unwatering the Easton mine, near Virginia City. The Easton mill has been closed for repairs. —The Conrey Placer M. Co. is said to have purchased the power ditch between Waterloo and Parrott, together with the power plant at Parrott. The Conrey Placer Co. operates dredger boats near Ruby, and it is stated that they are to construct a power line to connect the power plant with their dredgers and operate them by electricity.

#### Missoula County.

The tunnel being driven at the Nome mine, near Clinton, to strike the lead of the Bullion, is in 700 feet. H. T. Wilkinson of Missoula is interested.

#### Silver Bow County.

(Special Correspondence). —It is reported that negotiations have been reopened for a settlement of the copper fight in Montana between F. A. Heinze and the Amalgamated Copper Co., and, in connection with it, it is stated that H. H. Rogers will retire from personal management of Amalgamated affairs. —Senator Clark has ordered the construction of a 350-foot stack with dust chambers to recover arsenic and other values from the smelter smoke. —The Montana Coal & Coke Co. has resumed operations, after a suspension of six months, owing to labor troubles. The Montana smelters have in the past consumed all the product of the coal mines of that company and the Amalgamated has an option on a majority of the stock of the corporation, but has not yet indicated its intention to take up the option. The matter has been referred to B. B. Thayer, general manager, by H. H. Rogers and he has not yet acted. —The properties of the Speculator M. Co. will be formally transferred to the North Butte M. Co. —The Pittsburg & Montana Co. will be able to resume development work on its veins next week, when the accumulated water in the workings will have been pumped out, but there is no prospect of an early beginning of actual mining operations. —The Reins Co. has suspended work in the Combination mine on account of too much water.

Butte, May 1.

### NEVADA.

#### Humboldt County.

J. A. Nelson of Humboldt has sold his copper mine at Jackson creek to Malley & Darling of San Francisco, Cal., for \$60,000, the new company being known as the Humboldt C. Co. and intending to work the property on a large scale.

At Kennedy, J. R. Benton and C. E. Kennedy are working the Fourth of July and Hazel Bell. —Calhoun & Chamberlain are working the Hidden Treasure mine and running the 2-stamp mill at Kennedy. —It is reported that the Federal Mines Co., G. W. Dyke superintendent, will build a dredger to work the Spring Valley placers near Kennedy, hauling the machinery from Lovelock.

#### Lander County.

E. W. Carman has men working his claims in Red canyon, near Battle Mountain. As soon as the snow is gone work will begin on the lower levels.

#### Lincoln County.

The Keystone mine in the Yellow Pine district, 7 miles east of Sandy, which was recently sold to an English syndicate for \$337,500, is working twenty-five men. It is down 1100 feet on a ledge of talc. They have a 20-ton mill and 30-ton cyanide plant. —T. A. Johnson of the Con. Johnnie G. M. Co., 50 miles southeast of Bullfrog, says that 6000 feet of development work have been done on the Johnnie, including a shaft 500 feet deep. C. Schader is manager. In connection with the mine the company have organized the town of Johnnie, which has made application for a postoffice and expects to have a railroad connection soon. On completion of the Salt Lake Railroad a mail route will be extended from Good Springs siding to Good Springs, Sandy, Manse, Johnnie and north to Beatty.

H. T. Johnson of Los Vegas has taken an option on the Lucy Hawthorne and the Bug mines at Eldorado for \$15,000. —G. H. Atkins of Milford reports a strike in the Red Cloud mine at Good Springs. —The Pioche-Nevada Con. Co. at Pioche has just struck good ore.

Manager C. E. L. Gresh of the Black Hawk M. Co., at El Dorado canyon, has put a small hoist on the Buster claim and will sink the main shaft 50 feet to the 115-foot level and connect with shaft No. 1, down 165 feet, and shaft No. 3, down 85 feet. —G. M. Rose is building a 100-ton plant at Searchlight to work the Southern Nevada tailings.

#### Nye County.

Superintendent J. Simpson says that the main shaft of the Bullfrog M. Co. is down 70 feet, working in good ore. Two drifts, 20 feet each, have been run off the shaft into the ledge. The main tunnel, 220 feet deep, has cut four bodies of talc, revealing deposits of milling ore. Another crosscut 1500 feet from the shaft has uncovered a 6-foot ledge. A mill will be put in operation before October 1.

### NEW MEXICO.

#### Grant County.

J. Hartzog and M. T. Everhart report a rich copper strike in the Big Hatchet mountains.

#### Rio Arriba County.

M. Gill has six men at work upon the placers at Hope-well and intends to increase the force to twenty. —L. K. Kramer will work the Red Jacket and Dixie mines of the Queen M. & M. Co.

### OREGON.

#### Baker County.

Superintendent B. Rusk of the Platts group, Rock Creek district, reports that he has cut a rich body of ore in the main drift.

#### Grant County.

Operations are to be resumed at the Uncle Sam group, near Granite, under the management of S. S. Start of Sumpter. —The Scandia tunnel will be continued again. This tunnel is run through mineral ledges in the Alamo district and is in over 3000 feet. Work was suspended Jan. 1—the first shut-down for three years. W. Wade of Sumpter is manager.

Copper is being opened in a new district 15 miles from Izee. —It is reported that Manager W. J. Hughes of the Equity mine, near Prairie City, will put in a larger mill. —Superintendent J. Waddell of the Prairie Diggings, near Prairie City, is opening that property for heavy work and will sink the shaft 400 feet. It is now 200 feet deep, with two levels.

#### Josephine County.

The longest electric power wire for Oregon is that to be strung from the power plant of the Condor Water & Power Co. at Gold Ray to the Greenback and Martha mines on Grave creek. The distance from Gold Ray to Greenback is 45 miles. It is reported that arrangements have been made between the Condor Co. and the Greenback and Martha mining companies to supply all necessary power for the operation of these mines by electricity. —The placer season has been unusually short, owing to the light rain and snowfall, and already the streams are as low as they usually are in midsummer. The season has been a profitable one, and the amount of dust taken out will not fall far short of the average. The Galice Con. has done and is doing much preparatory work, and by the time the water comes again will be in shape for a big run. —At Silver creek the season has been good. The Metz & Leigh tunnel is in 900 feet, and at the 100-foot mark an upraise will be put through to the surface. This company has a trail from Galice creek 16 miles, and is preparing to build a wagon road from that point to its mines.

S. Chase, owning the Oro Fino, in the Joe Creek district, near Grants Pass, has been arranging to complete installation of his milling and cyanide plant this spring and commence treating ore. The plant consists of a Sturtevant breaker and one set of rolls combined, and leaching vats.

#### Lane County.

The Uncle Sam mining property, in the Blue River district, has been sold at sheriff's sale to J. W. Shumate of Wativille for \$5955.50.

### SOUTH DAKOTA.

#### Pennington County.

The Gopher G. M. Co. is putting in a compressor plant, drills and 5-stamp mill at the Gopher property, 3 miles north of Hill City. The Gopher shaft is down 175 feet. The company is preparing to build a power plant for its mill in Gopher gulch.

### UTAH.

#### Joab County.

The Mammoth mine at Eureka has been temporarily closed down by Superintendent S. McIntyre, laying off 135 men.

The shipments for April, ending the 27th, from Tintic mines were: Centennial-Eureka 351 carloads, Eagle & Blue Bell 26, Mammoth 41, Godiva 1, Yankee Con. 10, May Day 22, Uncle Sam Con. 13, Star Con. 1, South Swansea 4, Bullion-Beck 31, Gemini 42, La Clede 1, Carisa 5, Grand Central 19, Ajax 9, Bales, lease, 1, Osborn, lease, 1, Paxman, lease, 1, Victor 3, Godiva 2, Brooklyn 1, Swansea 2. Total, 587 carloads.

#### Plute County.

The I X L tunnel at Marysville is in 1200 feet and is to be continued. J. S. Snow of Manti is president.

#### Salt Lake County.

A. E. Snow, secretary and treasurer of the Columbus Con. M. Co. at Alta, reports that during March there were 454 tons of concentrates produced, of a value of \$28.24 per ton, or a total of \$12,820.02. The expenses were \$7000. The mine delivered to the mill 1768 tons of crude ore. The recovery from this ore amounted to \$8.74 per ton, distributed as follows: Silver, 8.59 ounces; lead, 2.85%; copper, 1.38%. The loss in tailings was \$2.70, distributed as follows: Silver, 3.32 ounces; lead, .12%; copper, .41%. The ore was concentrated in the ratio of 3½ tons of crude ore into 1 ton of concentrates. The average per cent saved was 99½. The principal development work now being done consists of the sinking of two shafts from the tunnel level. One is near the big lead stope. The other is a new shaft that is being sunk to operate the Howland ore body. The former shaft is down 100 feet. Drifting has now begun from the bottom, both east and west. The water in this shaft near the big lead stope makes it difficult and expensive to sink. The shaft which is being sunk at the Howland is about 100 feet from an older shaft that was standing full of water. When this water was pumped out the shaft was found to be caved, and it was considered advisable to sink another rather than clean the old one. The new one is double compartment and is now down 50 feet, and will be sunk to the 100-foot mark before drifting.

It is reported that the Utah Copper Co.'s mine is supplying the mill at Bingham Canyon with 900 tons daily. The main tunnel and a number of the laterals have been wired and the 5-ton electric locomotive has started hauling cars. It is expected to connect the 3rd east crosscut with the Quinn tunnel, giving a complete circuit. —The remodeled Kempton mill at Bingham is expected to start up soon. —The Utah Apex Co. is putting in a compressor near the mouth of the Corman tunnel. Superintendent McCree is shipping ore from the Parnell and Annie, near Bingham. —Superintendent G. Hannahs of the Starless mine, at Bingham, has started work on the Amanda tunnel, through which the property is to be developed under the Wall option. The tunnel has been cleaned out and an electric hoist put in. —The copper ore body recently opened up in the Keystone tunnel of the Fortuna Co., at Bingham, holds out good. Superintendent Start is sinking a winze from the tunnel level. —H. M. Adkinson, manager of the New England G. & C. Co. at Bingham, reports that he has resumed



milling operations. The enlargement of the plant will be commenced soon.—The Mystic Shrine property at Bingham, one of the promotions of E. W. Young of Denver, Colo., is reported to have passed into the possession of F. G. Shafer of Denver.

#### Sevier County.

It is reported that S. W. Tulloch, president of the Sevier Con. G. M. Co. on Gold mountain, near Richfield, has recommended that the mill capacity be doubled.

#### Summit County.

The tunnel on the Martin G. & S. M. Co.'s property in Thayne canyon is in 250 feet. A. F. Martin is in charge.—A. H. Elftman, consulting mining engineer of the Mount Masonic M. Co., at Park City, is at the mine from the Black Hills of South Dakota to inspect the recent development work at the property. The tunnel is now in 900 feet.

#### Tooele County.

Superintendent H. D. Trenam of the Stockton G. M. & M. Co. of Stockton reports that the mill is running steadily. The main shaft is being sunk deeper and will be continued to the 850-foot point, where a level will be established. The present depth of the shaft is 800 feet.

#### Utah County.

Manager H. J. Kruse of the Bog mine, in American Fork canyon, states that the water seam has been tunneled through and the face of the tunnel is dry.—The owners of the Steele property, in the head of American Fork canyon, are preparing to continue development.—J. H. Wooton of American Fork will start work on the Silver Glance.—The Gold Gem, known as the Cedar Stump discovery, near the mouth of American Fork canyon, will commence work on the 150-foot tunnel which will be run to tap the vein 100 feet below its present workings.—The Silver Flat M. Co. of American Fork intend to resume work on the Copper King.

F. C. Tyng, operating the Wyoming mine in American Fork canyon, says that conditions will not permit of any ore being shipped inside of six weeks. Men are working at the mine.—The Buckley mine, operated by Woodward Bros. in Rock canyon, west of American Fork, has shipped its first car of ore.—The Signet mine in American Fork canyon is running a 250-foot tunnel, following a well-defined vein.—G. Summerville, foreman of the Blue Rock mine in American Fork canyon, reports that the mine is being worked steadily.

### WASHINGTON.

#### Ferry County.

A new ore body is reported in the Morning Glory mine under lease to J. S. Berdiere of Republic.—At the Ben Hur mine the two drills are operated day and night. The ore which is being exposed is said to be of very good grade.

T. M. Hammond is making a preliminary survey for a railroad spur from Lambert creek to the summit of Belcher mountain. The mountain side is very steep and good for a 3% grade. Another route will be surveyed later on from Torboy, up the north fork of the San Poil river. These surveys are said to be for the purpose of ascertaining the cheapest mode of conveyance of ore from the Belcher mountain mines to the Washington & Great Northern and the Spokane & British Columbia River railroads.

#### Pierce County.

It is reported that the Tacoma Smelting Co. has completed its 300-foot reinforced concrete chimney at the smelter. It has an inside diameter of 18 feet and is designed to save the values from the fumes, to abate the smoke nuisance and to increase the draught.

#### Snohomish County.

Work is to be resumed at the "45" mine at Sultan.—Work on the Hecla, on Salmon creek, has been started by A. M. Watt.—Work has been started on the Bonanza Queen mine, near Silverton, by Superintendent S. A. Warner of Seattle. A new compressor is to be put in and driven by water power to be developed during the present season.—Work is being pushed on the property of the Buckeye C. Co.

### WYOMING.

#### Carbon County.

J. A. Phillips has sold his interests in the Phillips coal mines, 15 miles down the river from Saratoga, and the McCoid mine, 22 miles northwest of Saratoga, to A. J. Chidster of Grand Encampment and W. C. Sammons, agent for the Union Pacific at Walcott. The new owners will develop the coal mines at once, and place their product on the local market.

### FOREIGN.

#### AFRICA.

##### The Soudan.

W. Broadbridge, in the Mining Journal, discusses the possibilities of the Soudan as a gold field. The mines are within eight days' camel ride of the Suakim. Running north-south there is a chain of mountains 5000 to 6000 feet high. On the east side these mountains have smaller ranges of hills which terminate in undulating sandy plains extending to the Red sea. On the west are numerous inside ranges of hills stretching for 50 to 60 miles, where they join another range of mountains parallel to the main coastal range. These inside ranges are intersected in all directions by valleys and gorges, locally termed waddys, some descending steeply from the hills, others extending in flats over considerable distances. These waddys are the natural agricultural and pasture lands of the country; they support large herds of camels, goats and sheep. At one time this portion of the African continent evidently formed part of one vast tableland, the sedimentary rocks comprising this plateau having been depressed and the coastal ranges of granitic rocks uplifted. Accompanying these dislocations were numerous overflows of diabasic and dioritic rocks. The deformation of these rocks has resulted in considerable metamorphism, the resulting rocks being schists, gneiss

and conglomerates. Later posterior eruptions of trap-  
pean rocks, with faulting above zones of weakness dur-  
ing more recent geological ages, have produced the  
deposition of quartz reefs, more or less auriferous, ex-  
tending over a large area. The auriferous deposits are  
confined to the later formations and occur as fissures  
traversing both sedimentary and intrusive rocks and as  
impregnation deposits following the laminations of the  
enclosing rocks. The natives of the district are the  
Bischarin and Hadendowa Arabs. In disposition, by no  
means truculent, they are indolent and easy to get on  
with. They appear to like the idea of their country  
being opened up. While being by no means what we  
call fertile, still in districts, after a sufficiency of rain, the  
country is capable of a high state of cultivation. The  
methods of mining adopted by the ancient workers ap-  
pear to have been of two kinds, the first consisting of  
working the reefs from the outcrops downwards, follow-  
ing the reefs presumably to water level, or until it be-  
came unpayable; the second, in sinking a series of shafts  
in the line of reef and opening up stopes. They do not  
appear to have carried any drives or levels, the quartz  
mined being passed from man to man until it finally  
reached the surface. At the surface it was ground by  
hand between large stones, these grinding stones consist-  
ing of a lower stone which formed the mortar, the upper  
stone fitting in this and being turned by hand by means  
of an upright piece of iron or wood fitted into the stone.  
The stones forming the mortar are between 18 inches  
and 24 inches in diameter, shaped in the form of a circular  
basin. The quartz to be ground was fed into the  
mortar through a central hole in the upper or grinding  
stone. Both these stones consist of a very hard  
diorite and were evidently imported, no similar  
rock being found in the vicinity of the mines worked.  
The stopes that have been opened up in most instances  
were very narrow. All ore mined was worked out by  
means of hammers and chisels. On the whole, one could  
not be but favorably impressed with the possibilities of  
opening up a mining industry in the Soudan. The  
ruins of old mining camps, grinding stones and large  
dumps prove that in the past mining was conducted on  
a large scale, also that large quantities of the precious  
metal have been obtained. The local Arabs are not to  
be relied upon as a possible source of labor. The Fella-  
heen of Lower Egypt are a hard working, civil and  
indigenous to the country; there is here a large supply  
of labor ready to hand. The price for drill boys is £3  
per month; the price for laborers is £2 per month. In  
both cases they have to be fed, entailing a cost of 15s  
per man, bringing the cost, say, to £3 and £4 per month  
respectively. In addition there is the Italian miner,  
who can be imported into the country at £6 per month.  
He requires his food and passage, thus bringing his  
wages to £12 a month on a yearly contract. These men  
are the best class of miners—one accustomed to modern  
methods—the majority being excellent machine men.  
With mines lying 100 miles from the coast or the Nile,  
roads can be constructed with but very little expendi-  
ture. The waddy beds, with the larger sized boulders  
removed, would very soon make good roads. The local  
camels are obtainable in almost any quantity; they  
carry loads up to 300 pounds comfortably, traveling 15  
miles a day, the rates being small. In southern Egypt  
one sees small carts, carrying 1500 pounds dead weight,  
drawn by camels; these can be utilized in the Soudan.  
Camels to buy for transport purposes cost from £5 to  
£7 apiece. The Berber Suakim railway will be finished  
shortly; this will help considerably any mine opened up  
in its vicinity. Rates for transport should never exceed  
£5 per ton, and will probably cost considerably less.  
Timber is entirely absent from the country (with the  
exception of thorn trees), but can be imported direct  
from Europe at low rates. As regards timber for under-  
ground work, the want of local supplies should not pre-  
vent economic mining. Timber being absent, one has  
to fall back on coal or petroleum for power. Petroleum  
will cost, in most districts, up to £8 a ton delivered, as  
against coal at £6 a ton. The lack of water will be found  
the greatest drawback as regards economic and constant  
working. For reduction purposes one would have to  
rely either on the rainfall or wells; the water would, of  
course, be returned again and again, and if augmented  
with any mine water, should prove sufficient. For  
domestic purposes it is safe to assume a sufficient supply,  
as in most parts of the Soudan, water is found at com-  
paratively shallow depths. Provided water is obtain-  
able in sufficient quantities, working costs, including  
development, should not exceed 30s a ton, for labor is  
plentiful and not high priced; transport is cheap; sup-  
plies are obtainable at about 10% above European rates.  
To offset these factors are narrow reefs and high cost of  
fuel—but 30s a ton may be considered an ample margin.

### CANADA.

#### BRITISH COLUMBIA.

##### Boundary District.

Boundary ore shipments run over 300,000 tons for this  
year, the output for week ending April 29 being: Granby  
mines to Granby smelter, 12,390 tons; Mother Lode to  
British Columbia Copper Co. smelter, 4064 tons; Brook-  
lyn to M. & S. smelter, 2555 tons; Rawhide to M. & B.  
smelter, 763 tons; Mountain Rose to British Columbia  
Copper Co. smelter, 217 tons; Dominion Copper Co.'s  
Brooklyn and Stewindur dumps, 460 tons, to Trail  
smelter; Oro Denoro to Granby smelter, 100 tons; Provi-  
dence to Trail smelter, 20 tons; Last Chance to M. & B.  
smelter, 46 tons; E. P. U. to Trail smelter, 20 tons; total  
for week, 20,635 tons; total for year, 305,488 tons. The  
three district smelters treated ore as follows: Granby  
smelter, 12,500 tons; British Columbia smelter, 4126  
tons; Montreal & Boston smelter, 3342 tons; total for  
week, 19,968 tons; total for year to date, 310,775 tons.

##### East Kootenay.

The agreement between the C. N. P. Coal Co. and its  
employees, which has been in force since April 1, 1903,  
will expire on May 31, on notice from the miners' union.  
A new agreement has practically been arrived at and all  
fears of a strike are dissolved. Various conferences have  
been held between Manager Lindsey and Superintendent  
Drinnan for the company, and a committee of the

miners' union, and a settlement of a schedule and other  
particulars has been reached to the satisfaction of both  
parties. The committee of the miners consisted of F. H.  
Sherman, president of the district union of the U. M. W.  
of A.; P. Patterson, vice-president, and Biggs, Severn  
and Lawrenson, representing respectively the local unions  
at Fernie, Carbonado and Michel. This committee was  
assisted by W. E. Jones of Dietz, Wyo., who is a mem-  
ber of the international board of the U. M. W. of A.  
The agreement is to remain in force until March 31,  
1907, the expiry date of the U. M. W. of A. agreement  
in Alberta. The new schedule is similar to the old one,  
with a few minor changes. The C. N. P. Coal Co. is  
about to put in a compressed air locomotive system in  
No. 8 mine, Michel. The compressor, which will be in  
the power house, will have a capacity for charging  
the locomotives with 800 pounds pressure to the square  
inch. The air will be conveyed to the mine in pipes and  
along the entry will be charging stations where the two  
locomotives may be charged. These locomotives will  
have a daily capacity of 1200 tons. They will be suffi-  
ciently powerful to haul a train of forty loaded cars up a  
31% grade. At Michel there are six producing mines in  
active operation and two others being opened up. These  
are opened up by the pillar and stall method worked in  
panels. Mine haulage has been by rope. Ventilation is  
by fans worked as exhausters.

#### Roseland District.

The tonnage of ore shipped from and crushed at the  
Roseland mines for the week ending April 29 and for the  
year to date was as follows:

Mine.	Week.	Year.
Le Roi	2,100	44,805
Center Star	2,010	30,988
War Eagle	1,280	21,450
Le Roi 2	130	3,623
Le Roi 2 (milled)	1,600	1,600
White Bear	25	1,100
White Bear (milled)	300	3,000
Jumbo	400	2,925
Spitzee	90	3,614
Velvet-Portland	1,977	1,977
Totals	6,335	115,087

### JAPAN.

The Far Eastern Review, in describing the coal mines  
of the Kaijima M. Co. on the island of Kyushu in the  
prefectures of Fukuoka and Saga, says that the collieries  
at Ohnoura, Ohtsuji and Yunokibaru produce 2061  
tons daily. The Ohnoura coal is won by pillar and  
room system with hand work. Timbering consists  
mostly of pine logs, but near the pit brick supports are  
in use. For drainage purposes sixty-three special pumps  
are installed at the pits, and altogether 125 cubic feet of  
water per minute is pumped out of the mines. Ventila-  
tion is effected naturally except in the case of the Kirino  
mine, where a Champion ventilator, capable of discharg-  
ing 75,000 cubic feet of air per minute, is worked by  
steam. The mines are lighted by Davey and Clanny  
safety lamps. At the Sugamuta mine, electric light is  
used on the surface. There are 6800 mine workers em-  
ployed at the mine.—Trunk railway is constructed on  
the chief mine roads. To hoist cars running on rails,  
six winding engines are worked by steam. Surface  
transport varies according to the mines. In the case of  
the Sugamuta mine, the coal from the different pits is  
conveyed to the screening house at the mouth of the  
shaft by endless rope tramway. After screening is  
effected, the coal is transported to the company's coal  
sheds at Katsuno, and there it is loaded in railway cars  
and sent to Wakamatsu (18 miles) or Moji (20 miles). In  
the case of Ohnoura mine, the coal is transported to the  
screening plant at Kirino, and there loaded in railway  
cars to be sent to Wakamatsu or Moji. In the case of  
Kirino, the coal is directly put in railway cars after  
screening and conveyed to Wakamatsu and Moji, 20  
and 31 miles respectively. In the case of Mannoura, the  
coal, after it is lifted out of the mines, is drawn by horses  
on rails as far as the Inunaki river, 7200 feet, thence to  
Kirino (2400 feet) by endless rope tramway. At Kirino  
the coal is transferred to railway cars and sent to Waka-  
matsu or Moji. The Ohtsuji colliery comprises the  
Ohtsuji Nos. 1 and 2, Shiraiwa Nos. 1, 2 and 3 in Onaga  
district, Chikuzen province. The product is carried to  
the canal at Wakamatsu. The colliery is 1 mile south-  
west of the Azamibaru station on the Karatsu branch of  
the Kyushu railway. The mining concession covers an  
area of 1979 acres. The method of mining is that of the  
longwall and pillar and room systems combined. There  
are eight special pumps at work for drainage purposes.  
The length of the drift is 3090 feet. The workmen em-  
ployed in and out of the mine workings exceed 1000.

### MEXICO.

Estimates shows that the new decrees in reference to  
the mining industry of Mexico, which were recently  
promulgated by President Diaz as a result of the plans  
for monetary reform, will save the mine owners of  
Mexico about \$4,000,000 annually. Taxes on the mining  
industry last year provided the Government a revenue  
of \$9,500,000, and as a result of the tax reductions just  
granted the industry will pay no more than \$5,500,000.  
The demands made on the Government by the mine  
owners contemplated a saving of \$5,000,000. It is stated  
that following the establishment in the City of Mexico of  
a permanent commission to represent the mine owners  
of Mexico, a demand will be made on the Government  
for a law providing for the permanent ownership of min-  
ing property. The Government will be asked to issue  
patent rights to mine owners who have paid taxes  
regularly on mining claims for a stipulated period of  
time. At the present time any mining claim is in danger  
of forfeiture through non-payment of taxes, regardless  
of the length of time covered by tax payments. Another  
demand to be made by the mine owners has to do with  
permanent landmarks in the measurement of mining  
claims. At the present time duplicate denunciations  
are of common occurrence.

The National Dynamite Co., which recently had a con-  
siderable portion of its factory destroyed by an explo-  
sion, is importing dynamite from the United States so  
as to make good its contract to supply the market pend-  
ing the repairing of the factory. Work of clearing away



the debris at the factory at La Tinaja, Durango, has commenced and it is claimed that the destroyed portions can be replaced in two months. The annual consumption of dynamite in Mexico is given as 150,000 cases.

#### Chihuahua.

The 15-stamp pan amalgamation mill of the Dolores M. Co. at Minaca has been started. The cyanide plant is not yet completed. J. G. Hardy is acting manager.—J. F. Johnston of Parral is developing the Garniquona, east of El Vallo.

Juan A. Creel, manager of the Banco Minero, has given to C. E. Nord of Chicago an option on the Rio Tinto copper mine at Terrazas. The option includes the smelter on the property.—The annual report submitted by the Batopilas M. Co. at Batopilas for 1904 states that the mill ran 319 days, crushing 27,958 tons of third class ore, which produced 204,697 ounces of concentrates, valued at \$1 per ounce. The bullion product was 516 bars, yielding \$623,542. The average value of the ore was \$21.80 per ton. The ore tonnage was increased by 3024 tons.—The 40-stamp mill of the Pittsburgh-San Jose Railroad & Reduction Co. at San Jose del Sitio has been started up, with N. Rich in charge.

B. Gilpin of Los Angeles, Cal., and H. La Montayne of Hillside, Ariz., have taken over the Prieta mine at Parral and propose to sink the shaft 200 feet deeper.

The Constanza M. Co. at Sierra Mojada is working two mines and have several properties leased to other companies. They have 200 men and are producing 4000 tons. W. Hagemann is manager.—The Cia. Metalurgica Mexicana, the R. S. Towne's properties, under the management of G. H. Carnehan, is working the Veta Rica mine, near Sierra Mojada, producing 1500 tons per month.

#### Durango.

The Lustre M. Co. of Inde is ready to blow in its new 150-ton smelter, this making its third.—W. S. Morse, general manager of the southwestern department of the American S. & R. Co., is authority for the statement that work has been started on the company's new smelter at Velardena. This plant will have an ultimate capacity of 2000 tons daily.

#### Guanajuato.

The La Luz M. & T. Co., which proposes to drain and operate a number of old mines in La Luz camp, has purchased the Bolanitas mine in that camp from Jesus Andrade. Dwight Furness of Guanajuato and G. W. Jennings of the City of Mexico are interested.

#### Jalisco.

Arrangements have been made by the Mazeppa Con. G. M. Co. to take over the Aguila mine in the Hostipaquillo district. The mine is owned by W. T. Thornton.—On the Contla hacienda, municipality of Tamazula, H. Sablayroless of Zapotlan has discovered a new silver vein.

The Zapopan G. M. Co. proposes to run a crosscut tunnel into the Zapopan, in the Yesca district, to cut the vein below the old workings.—The Aztec C. S. Co. of Philadelphia, Pa., is preparing to put up reduction works on its property north of Huacabinango. Timber is being cut on the land and the roads to the mine put in shape, preparatory to bringing in the machinery. The company, of which G. J. Graham is general manager and J. P. Johnson superintendent, owns the mines Perla, Concha and Mascota. The ores are copper, gold and silver and the development consists of shafts and crosscut tunnels.—Good ore is being taken from the San Juan shaft of the Cinco Minas property in the Hostipaquillo district. The reduction works are at the Santo Tomas hacienda, 25 miles distant, and the old process of ore treatment, amalgamation by arrastras and patio, with water for power, is still followed.—H. H. Sawyer of Philadelphia, Pa., has purchased the mines of the Bautista M. Co., in the Bautista camp, 70 miles south of Ameca, and the company will erect a reduction works to treat the ore at the mines.

W. M. Mathews, of Etzatlan, has sold to R. C. P. Smith and associates of Los Angeles, Cal., the Refugio mine, between Etzatlan and Ahualulco. Work has been commenced.—A. R. Mignon, of Fort Worth, Texas, has been at Etzatlan arranging to begin work on the Bonanza mine, 1 mile south of Etzatlan.—The cyaniding plant at the Atrevida mine in the Ameca district, which is owned by Glanville Hart and associate, is now in operation. The capacity of the mill and amalgamating plant at the Atrevida property has been recently increased, and the tailings will now be treated by the cyanide process.—At Parnaso, the San Rafael M. Co., in which W. H. Leonard is interested, has converted the old "hacienda de beneficio" from patio amalgamation to concentration with subsequent cyaniding, and is reported to be getting excellent results.

#### Oaxaca.

The Old Mexico M. Co., F. H. Wilson president, has put in a milling plant on its property, 35 miles from Oaxaca.

#### Sinaloa.

An American company, with a stated capital of \$500,000 gold, has been formed to take over the Yauco mines near Rosario. M. F. Campbell promoted the company, which will be known as the Lomas de Oro M. Co.

### NEW ZEALAND.

It is understood that tests at Charters Towers of crushing and concentrating ore as against crushing, concentrating and grinding, have resulted in favor of the latter, the grinding invariably giving satisfactory returns. Of two lots of ore from the Ruby mine, 108 tons crushed and concentrated at the Lady Florence mill realized £1056 10s, while 108 tons crushed, concentrated and ground at the Bonnie Dundee mill yielded £1109 18s, the grinding thus showing to advantage £53 7s 9d, or 10s per ton. It is now anticipated that grinding will be more largely resorted to.

### Dividends.

The Bunker Hill & Sullivan Mining & Concentrating Co. has declared dividend No. 91 of \$150,000, payable on May 4th. This makes a total paid since January 1st, 1905, of \$525,000, and a total to date of \$2,796,000.

## Personal.

C. M. FUELLER of Denver, Colo., is in Birmingham, Alabama.

F. KAHN of Inde, Durango, Mexico, has been in New York City.

A. C. WERDEN has charge Reliance M. & M. Co. near Prescott, Ariz.

J. W. MALCOMSON of El Paso, Texas, has been at Durango, Mexico.

A. A. TAUBENECK is superintendent Tin Pan mine, near Gold Hill, Or.

F. J. FROST is superintendent of mining property near Buena Vista, Colo.

F. W. BRADLEY, E. M., has returned to San Francisco, Cal., from the East.

J. J. DEMING has been appointed superintendent Gold Eagle mine, near Neil, Idaho.

J. B. FARISH of Denver, Colo., has left San Francisco for a two months' trip to the Orient.

G. F. OBER has returned to Denver, Colo., from a trip through Tonopah and Goldfield, Nev.

C. B. EATON has charge of cyanide plant of Supply M. Co. at Dale, San Bernardino county, Cal.

C. D. AVERY has been appointed surveyor for the Gemini & Godiva M. Co. at Eureka, Utah.

C. H. FULTON has been appointed president South Dakota School of Mines at Rapid City, S. D.

F. LONGMAID has been appointed manager Vacas-San Marcos M. & M. Co. at Vacas, Durango, Mexico.

C. E. GROVE is at the Crystal Con. mine at Bohemia, Or., to determine how the ores should be treated.

W. J. KEOUGH of Granite, Or., has been appointed superintendent Minerva M. Co. of Atlanta, Idaho.

W. H. YOUNG, superintendent King Solomon mine, near Cecilville, Siskiyou county, Cal., is at the mine.

N. C. BONNEVIE of Denver, Colo., has returned from mine examinations in Washington and British Columbia.

P. C. MCCARTHY, manager Hidden Treasure mine, Lake City, Colo., has returned there from Denver, Colo.

I. W. VON LEER has been appointed general manager El Carmen Copper Co. at El Carmen, Durango, Mexico.

J. C. BARROWS of Centerville, Iowa, has been appointed manager Mountain Monarch M. Co. of Gilpin, Colo.

C. E. KROH of Kansas City, Mo., has charge of putting in a new mill at the Mayflower mine, Warren, Idaho.

W. DARLINGTON has been appointed superintendent Bagdad-Chase mines, near Ludlow, San Bernardino county, Cal.

H. W. EDMONDSON is superintendent Dolores mine at Minaca, Chihuahua, Mexico. M. P. Lefave is mill superintendent.

F. W. PAGE, general manager United Mexican M. & M. Co., has returned to Mascota, Jalisco, Mexico, from the United States.

F. W. HOAR has been appointed to succeed J. H. Knowles as superintendent and general manager Chiricahua D. Co. at Paradise, Arizona.

T. D. MURPHY of El Oro M. & R. Co. has been appointed assistant manager Guanajuato Reduction & Mines Co. at Guanajuato, Guanajuato, Mexico.

J. P. WEYANT, secretary of the Weyant M. Co., and C. H. Nazro, superintendent of the company, are examining and sampling mines near Weiser, Idaho.

R. C. TURNER of San Francisco, Cal., is acting general manager Dolores M. Co. at Minaca, Chihuahua, Mexico, during the illness of Manager J. S. Hardy in Chicago, Ill.

P. H. MOSMON has been appointed superintendent of the smelter at East Helena, Montana, succeeding W. W. Norton, who is now superintendent Murray smelter, Salt Lake City, Utah.

A. H. LAWRENCE, who has been managing the prospecting operations Los Tajos D. Co. at Morelos, Chihuahua, Mexico, has returned to the United States and expects to go to England.

## Books Received.

"Project for the Panama Canal," by L. W. Bates, gives a good idea of conditions at the isthmus and proposes methods of working that seem to possess considerable merit.

"Mining Operations in the Province of Quebec for 1904," by J. Obalski, is devoted largely to a description of the mineral resources of the Lake Chibogomo region, as discovered on a prospecting trip by the author.

To most engineers the training received in drawing is useful chiefly in the quick interpretation of what another seeks to explain by drawing, and anything that tends to render such representations more intelligible will be appreciated. In "Descriptive Geometry," by J. A. Moyer, the author has given an excellent text book on the principles of orthographic projection. The treatment is

thorough and logical and the explanations are particularly good because of their conciseness. The problems explained are more practical than are usually given in a book of this kind. It forms a valuable addition to the working library of an engineer. It is published by John Wiley & Sons, 43 East 19th street, New York City, for \$2, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Trade Treatises.

A booklet for those thinking about pumps from the Goulds Manufacturing Co., Seneca Falls, N. Y., describes triplex power pumps.

"Engineers' Chums," from the Mound Tool & Scraper Co., describes scraping tools, cold chisels, files and packing tools for use in the engine room.

The Urie-Snyder Dredge Co. of Kansas City and 34 South Clark St., Chicago, Ill., issue an interesting catalogue describing their placer dredgers and parts.

Bulletin 51 of the Crocker-Wheeler Co., Ampere, N. J., describes their form F machines, either motors or generators, giving outputs from 3 H. P. to 93 H. P.

The operation and construction of box car loaders is attractively set forth in a recent booklet of the Christy Box Car Loader Co., 811 Equitable Bldg., Des Moines, Iowa.

The eighth edition of the illustrated catalogue and price list of Wm. Powell Co., 2525-2531 Spring Grove avenue, Cincinnati, O., portrays valves, oilers, injectors and gauges.

Fan motors, both direct and alternating currents, are illustrated in Folders 4044 and 4045 of the Westinghouse Electric & Manufacturing Co. of Pittsburgh, Pa. The subject is attractively presented.

The Hardsocg Wonder Drill Co. of Ottumwa, Iowa, in their Bulletin A announce the Big Wonder air hammer rock drill as a 60-pound machine, to be mounted for raising, stopping and drifting in hard, dry ground.

The National Electric Co., Old Colony building, Chicago, Ill., issue an attractive brochure of handsome half-tone illustrations of their electrical apparatus and a few installations in "Plants and Types," a good illustration of printers' fine art.

The Columbia Engineering Works of Portland, Oregon, issues an attractive description of the Phillips Hydraulic Ram, which is so designed that no heavy shocks have to be withstood. Considerable valuable information on hydraulic matters has been incorporated in the booklet, which will interest all engaged in hydraulic mining and irrigation.

## Commercial Paragraphs.

C. O. BARTLETT & SNOW Co. of Cleveland, Ohio, state that they have got part of their buildings under cover and are operating most of their machines, so there will be no delay in getting out orders and filling new ones.

At the annual meeting of the stockholders of the Joseph Dixon Crucible Co. the old board, consisting of E. F. C. Young, J. A. Walker, E. L. Young, W. Murray, G. T. Smith, J. D. Bedle and G. E. Long, was unanimously re-elected. The board of directors re-elected the former officers, namely: E. F. C. Young president, J. A. Walker vice-president and treasurer, G. E. Long secretary. J. D. Bedle was also re-elected as counsel. Of the total number—7345 shares—there were represented 7145 shares.

THE Colorado Iron Works Co. of Denver, Colo., report the following orders and shipments: Copper smelting furnace and equipments for the Cooke City Smelters Co. in Montana; smelting equipments, consisting of one carload of jackets, etc., for the Selby Smelting & Load Co. in California; six carloads of machinery for the Compagnie Francaise de Mines du Laurium smelting plant, near Laurium, Greece, Europe; three carloads of concentrating machinery for the Poland American & Lincoln M. Co.'s plants in Arizona; sampling machinery, screens, etc., for the Holmes Sampling Works in Colorado; concentrating machinery, consisting of four Simplex Bartlett concentrating tables, impact screens, etc., for James Richardson & Sons, Ontario, Canada; experimental concentrating plant for the Imperial Copper Co. in Arizona; machinery and supplies for the Guanajuato Reduction & Mines Co., Ltd., in Old Mexico.

THE Denver Engineering Works Co., McPhee Bldg., Denver, Colo., has developed an electrical drill for stopping and upper workings. This drill is known as the "Box Kid." It follows in design the principles in the Standard box electric rock drill. As in the larger drill, the electric motor is direct connected and when in operation forms part of the drill. The motor is dismounted by the removal of one pin. The motor reciprocates a hollow cylinder carrying the hammer, and the steel is held loosely in the chuck and rotated, the effect being the same as in hand drilling. The complete weight of the drill is 140 pounds. The length of the drill and guide shell, over all, is 28 inches; with feed all out, 43 inches. The length of the feed is 18 inches. Actual running tests show that about 0.75 H. P. is required while drilling at maximum speed. It is claimed that a 1-inch hole can be drilled in Platte canyon granite at the rate of 3 inches per minute. The motor is series wound for 115 or 230 volts, direct current.



## Latest Market Reports.

SAN FRANCISCO, May 5, 1905.

## METALS.

**SILVER.**—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 56½c, refined (1000 fine); San Francisco, 56½c; Mexican dollars, 46c, San Francisco; 44½c, New York.

**COPPER.**—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15@15.25; Electrolytic, 1 to 3 casks, \$15.25; Casting, 1 to 3 casks, \$14.75. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: \$65 10s spot per ton.

**LEAD.**—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 11s 3d per long ton.

**SPELTZ.**—New York, \$5.80; St. Louis, \$6.15; London, £23 12s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

**TIN.**—New York, pig, \$30.00@30.30; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 3½c. London, £138 5s.

**PLATINUM.**—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

**QUICKSILVER.**—New York, \$38.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 per flask of 75 lbs.; Denver, \$45.00.

**BABBITT METAL.**—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c. Solder.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

**ZINC.**—Metallic, chemically pure, 3½c; dust, 3½c, 10c; sulphate, 3½c, .04c.

**NICKEL.**—New York, 55@60c per lb.; ton lots, 40@47c. ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

**ALUMINUM.**—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

## STRUCTURAL MATERIALS.

**IRON.**—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

**STEEL.**—Bessemer billets, Pittsburgh, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

**WHITE LEAD.**—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 4c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c. LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

**CEMENT.**—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

**NAILS.**—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

**LUMBER.**—(Retail): Pine, ordinary sizes, \$24.00@50.00; extra sizes bigger; redwood, \$28.00@30.00; latb, 4 feet, \$4.50@5.00; pickets, \$21.00@shingles, \$2.50 for No. 1, and \$2.25 for No. 2; sbakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

## GENERAL SUPPLIES.

**ANTIMONY.**—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

**COAL.**—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

**POWDER.**—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

**FUSE.**—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

**CANDLES.**—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

**CHEMICALS.**—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½c—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

**BORAX.**—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

**BONE ASH.**—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

**LITHARGE.**—Pure, in 25-lb. bags, 8@9c per lb.

**MOLYBDENUM.**—Best, \$2.75 per lb.

**CHROMIUM.**—90% and over, 3½c per lb., 80c.

**PHOSPHORUS.**—American, 3½c per lb., 70c.

**SODIUM.**—Metal, 3½c per lb., 50c.

**BISMUTH.**—Subnitrate, 3½c per lb., \$2.10.

**URANIUM.**—Oxide, 3½c per lb., \$3.50.

**MERCURY.**—Bicarbonate, 3½c per lb., 7c.

**TUNGSTEN.**—Best, 3½c per lb., \$1.25.

**SILVER.**—Chloride, 3½c per oz., 90c@1.00; nitrate, 55c.

**RED LEAD.**—500 lbs. and over at one purchase, 3½c per lb.; less than 500 lbs., 7½c.

**MANGANESE.**—Black oxide, 3½c per lb., 2½@4c.

**MAGNESIUM.**—Pure, N. Y., \$1.60.

**FIRE BRICK.**—Domestic, carloads 7 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

**FIRE CLAY.**—Domestic, 3½c per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast Inventors:

FOR THE WEEK ENDING APRIL 25, 1905.

788,449.—HOIST—Boquet & Sweeney, Pasadena, Cal.  
788,243.—LOC SAWING MACHINE—C. E. Brown, Dayton, Or.  
788,092.—LEATHER WORK—E. E. Burton, Santa Barbara, Cal.  
788,021.—PHOTO PRINT MACHINE—S. Cohen, Santa Barbara, Cal.  
788,095.—DUMPING CAR—A. W. Dahmer, Sonoma, Cal.  
787,979.—WATER MOTOR—L. D. Falconer, Seattle, Wash.  
788,042.—SWEEPING COMPOUND—A. Ceta, San Francisco.  
788,463.—SHEAVE—J. E. Gilchrist, South Bend, Wash.  
788,464.—GRIP DEVICE—B. H. Green, Los Angeles, Cal.  
787,981.—DENTAL DISK SHIELD—W. F. Green, Modesto, Cal.  
788,185.—SLIP LOOP—C. Heilrath, Sacramento, Cal.  
788,410.—CONCRETE CASING—F. A. Koeltz, San Francisco.  
788,054.—LOOP BOX—W. C. Lawrence, Portland, Or.  
788,485.—VOTING MACHINE—J. B. Mahana, Tacoma, Wash.  
787,992.—RECEIVING DOG—A. B. McCulloch, Kapousin, Wash.  
788,115.—BROILER—C. C. Messmer, Spokane, Wash.  
787,932.—AIR BRAKE—A. D. Miller, Seattle, Wash.  
788,163.—POULTRY COOP—W. Mitchell, North Yakima, Wash.  
787,989.—MUSIC LEAF TURNER—W. J. Morris, Marysville, Wash.  
788,053.—NUT LOCK—W. L. Morrow, Stockton, Cal.  
788,324.—NUT LOCK—W. L. Morrow, Stockton, Cal.  
788,115.—BOTTLE—F. A. Muller, Oakland, Cal.  
788,327.—SAVINGS BOX—A. Nelson, San Francisco.  
788,490.—SWACE—C. L. Nel, Seattle, Wash.  
787,942.—PAVING BLOCK—T. S. Pierce, Walla Walla, Wash.  
787,943.—GATE—L. G. Price, Kings Valley, Or.  
788,067.—VAPOR BURNER—L. Rhodes, Spokane, Wash.  
788,063.—STEAM BOILER—L. Rhodes, Spokane, Wash.  
788,495.—JAR CLOSURE—L. C. Savin, Fullerton, Cal.  
788,075.—MOLE TRAP—A. Y. Swope, Winlock, Wash.  
787,958.—FEED WATER HEATER—Tabrett & Lewin, San Francisco.  
788,289.—CORSET SHIELD—J. S. Thayer, Los Angeles, Cal.  
788,383.—WRENCH—P. C. Thayer, Oroville, Cal.  
788,079.—GAS REGULATOR—F. Wheeler, Los Angeles, Cal.  
788,081.—PLATING MACHINE—W. Wolkan, Portland, Or.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

**RIBBON PAPER FEEDER AND CUTTER.**—No. 787,662. April 18, 1905. Edwin D. Casterline, San Francisco, Cal. This invention relates to improvements in devices for cutting strips of paper and other material into definite uniform lengths. It is designed especially for cutting cigarette paper and to be used in conjunction with a folding machine. Its object is to provide a simple, durable, automatic, rapid and continuous machine for cutting any number of simultaneously fed paper strips or ribbons into proper uniform lengths. It consists in the combination of two co-operating endless carriers, having each a plane arranged parallel to a plane of the other means, including adjustable longitudinal guides, for varying the space between said planes, other guides carried by the first-named guides and bringing said interspace, a transversely operating cutting device associated with the carriers and means for operating the cutting device and carriers co-ordinately.

**NON-REFILLABLE BOTTLE.**—No. 788,115. April 25, 1905. Frederick A. Muller, Oakland, Cal. This invention relates to a device which is designed to prevent the refilling of bottles after their contents have once been exhausted. It consists in a bottle having a seat at the junction of the neck and body, a valve closable upon the seat, a superposed plug composed of parallel disks with openings which do not register and intermediate shanks of smaller diameter, a second plug located above that first named and having a tortuous passage therethrough and devices by which said plugs are permanently fixed in the bottle-neck.

**CONCRETE CASINGS.**—No. 788,410. April 25, 1905. Frederick A. Koeltz, San Francisco, Cal. This invention relates to a concrete casing which is especially designed for the inclosure of piles and like structures and those parts which are exposed to the ravages of insects or by other deterioration. The device comprises a hollow concrete casing composed of independent lengths axially in line, sleeves by which said sections are maintained in position, an interior pile driven through the casing, an intermediate filling of concrete tamped around the pile and anchor-bolts projecting upwardly from the concrete for the attachment of a cap.

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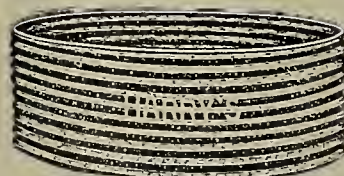
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# MINING AND SCIENTIFIC PRESS

Whole No. 2338.—VOLUME XC.  
Number 19.

SAN FRANCISCO, CAL., SATURDAY, MAY 13, 1905.

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## Shannon Copper Co.'s Works, Metcalf, Ariz.

In the Clifton district, Graham county, Ariz., one of the important properties is that of the Shannon Copper Company, whose large reduction works are here illustrated. The mines are near Metcalf and 7 miles from Clifton. The company owns a number of mining claims, the most important, however, being the original purchase, the Shannon and Hughes mines. The company built a complete smelting plant on the hillside above the Fresno river, near Clifton; but after a short run the management found that their ore could be more profitably treated if it were first concentrated. Accordingly a concentrator was built on the hill above the smelter. It is fully equipped with the usual rock-crushing devices—breakers, rolls, etc., with trommels, jigs, vanning machines and tables—so that a saving is made all along the line from every grade of material coming from the rolls—coarse, fine and middlings. The oversize from the first trommels goes to the rolls, the oversize from the remaining three trommels going to the jigs. The various sizes of material passing the graded screens of the trommels go to jigs suited to their kind. The jigs tailings are reground in a Huntington mill, the product from which is sent to twelve tables. Other tables treat the overflow from the classifiers. The slimes are run to a division settling tank, from which the clear water is pumped back for reuse. The ores consist principally of pyrite and chalcopryite and chalcocite (copper glance). These sulphides constitute by weight about 20% of the ore, and five tons are concentrated into one. The smelting operations are conducted in the usual manner, the product being matte, which is resmelted and converted at the larger plant of the Arizona Copper Co. The ore is sent from the mine to the railroad by an inclined tramway 1500 feet long, having a vertical rise of 800 feet. The ore is handled in ten-ton cars, the loaded car hauling the empty up. In places the



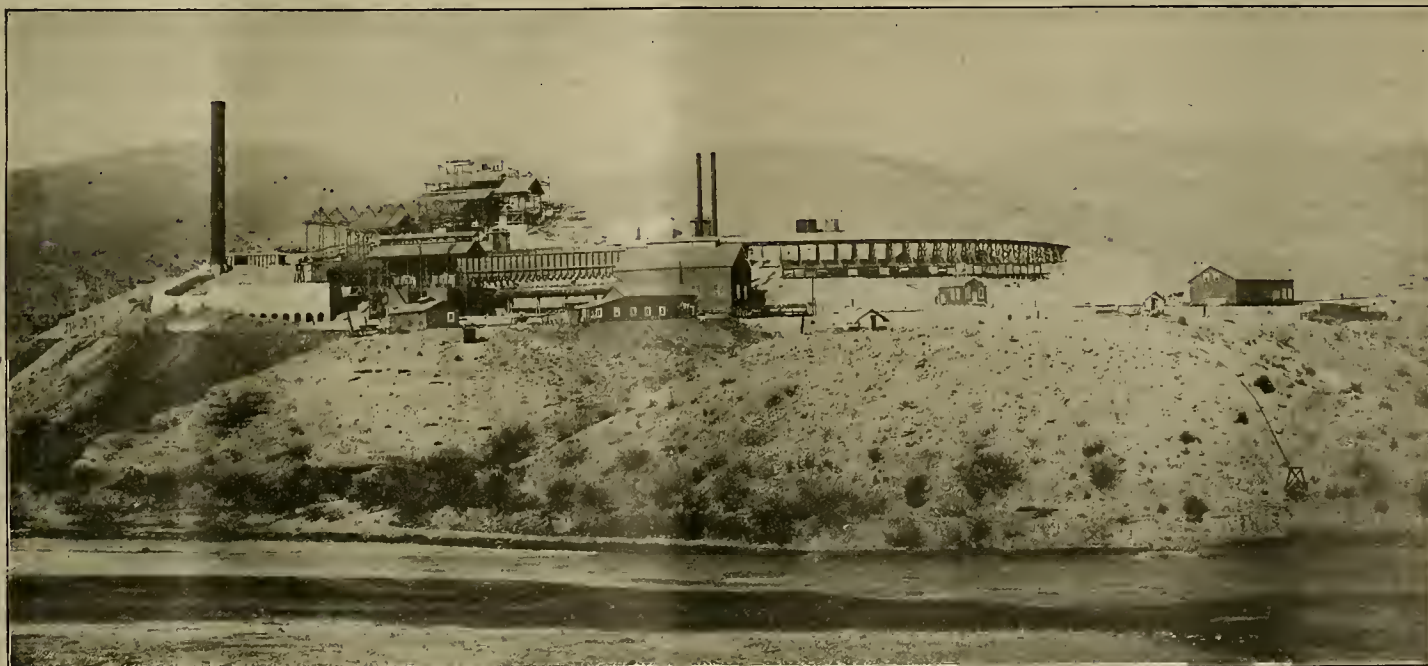
Pewabic Mine, Gilpin Co., Colo.

ore body is over 300 feet wide. The stopes are timbered by square set method, but little filling is used owing to the good-standing dry ground. There is a great variety of copper ore in the Shannon mine, all being the secondary products of the alteration of chalcopryite. The vein or mineral zone is capped with a heavy deposit of iron oxide, also the result of the decomposition of the sulphide zone, but from which the copper has been leached to a great extent.

## A Central City, Colorado, Mine.

The Pewabic Con. G. M. Co., J. C. Fleschutz manager, has the main shaft down 460 feet on the incline. Levels are driven in two directions at 200, 300 and 400 feet. The 200-foot level is connected by an

upraise with another 200-foot shaft on the Pewabic, to the west of the main working. In the other direction the level has been driven to connect with the 200 foot level of the shaft on the East Pewabic. The East Pewabic is down to a depth of 400 feet, and, with the connections, furnishes air to the other workings. The Lyons and Pewabic veins are 125 feet apart, and it is the intention of the management to install an air compressor, hoist and other machinery on the Lyons and operate it under the same roof as the Pewabic. The illustration on page 299 is that of the interior of the Main Pewabic shaft buildings, showing skip ready to dump. The skip is dumped automatically. The main buildings of this plant are shown in the accompanying illustration. It is one of the important mines of Gilpin county, Colo., and is situated in Russell Gulch, near Central City.



Reduction Works of the Shannon Copper Co., Metcalf, Ariz.



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THE law recently passed by the Oregon Legislature in regard to dynamite and other nitro powders, fuse, etc., is calculated to lessen the danger to miners who may be unfamiliar with the physical signs which indicate to the experienced and observing the unfitness of these materials for mining use. Much powder used in mines is old and has been subjected to a wide range of temperature which often unfits it for the best results in mining, beside making it dangerous to handle. The law requires that all powder, fuse, etc., used in blasting operations, either shipped into Oregon or made in that State, shall have the date of manufacture stamped on the box and wrappers containing these articles.

THE latest and not the least interesting phase in the wave of lawsuits sweeping over the smelting industry in the United States is the issue of an order from the United States Circuit Court of Montana directing the Anaconda Copper Co., whose great plant is the Washoe smelter at Anaconda, Mont., to show cause why a temporary injunction should not be issued against the operation of the Washoe smelter. The order has been made on complaint of farmers of the Deer Lodge valley, who claim that their farms and stock have been damaged to the amount of \$2,000,000. This suit has probably been brought in view of the result of the suit of the Government against the Mountain Copper Co. at Keswick, Cal. The order merely calls upon the Anaconda Co. to show cause why their metallurgical operations should not be restrained. What the outcome will be is difficult at this time to state.

THE late agitation over the commercial conditions controlling the production of crude petroleum in the State of Kansas has led to legislation calculated to harmonize conflicting interests and to promote the welfare of the petroleum industry in that State. Among the things accomplished in aid of the oil producers was the passage of bills authorizing the

establishment of an oil refinery to be operated by convict labor; one making pipe lines within the State common carriers, thus placing them on the same footing as railroads; another bill fixing maximum rates of transportation of oil by railroad or pipe line, and these charges for given distances not to be exceeded by any common carrier, the pipe lines being placed under the jurisdiction of the State Railroad Commissioners. Still another law was passed prohibiting discrimination between different localities in that State in the selling of commodities. Whether other oil-producing States will follow the example of Kansas in the effort to promote the oil industry and to prevent discrimination remains to be seen.

## The Locator and His Discovery.

Notwithstanding the fact that the Federal law plainly says a discovery of mineral-bearing rock in place must be made prior to location, many locations are made before a discovery and the actual discovery accomplished later by the work of exploration. The courts have decided that a location so made is valid and dates from the discovery of mineral by the original locator, provided no other party makes a discovery before him. There is, however, a growing tendency on the part of the courts to protect the prospector who locates in good faith and with diligence seeks to make a discovery by working on his claim after the act of location. In those instances where veins plainly outcrop there is no excuse for location prior to discovery; but there are places where discovery is impossible without days, or weeks, and, in some instances, months, of work. Leadville, Colo., affords an excellent example of this condition, for the ore deposits of that district are to a very great extent covered by deep deposits of glacial drift and sheets of porphyry. The siliceous ore bodies of the Cambrian and Carboniferous formations in Lawrence county, S. D., are in many instances similar where the formations originally overlying the ore bodies have not been removed by erosion. In California miles of vein-bearing territory are covered by the debris of the ancient rivers and their volcanic capping. At Tonopah, Nev., the extensions of the known mineral veins run underneath the later andesites, and surface discovery is impossible. It must not be thought that the courts will protect those who merely make locations without discovery, and then make no attempt to find mineral. It requires earnest and continuous effort on the part of the prospector to find a mineral deposit within the lines of his claim by actually working at shaft sinking or tunneling or sinking bore holes. Having found the mineral, an amended location may be made which does not conflict with the pre-existing rights of others. In former years the strict letter of the law was adhered to, and half a dozen different parties might prospect on a given area, all having made locations, and the first party to reach a mineral vein or deposit was awarded the claim by the courts. Leadville furnished numerous examples of this practice; but this was so manifestly unfair to the others whose efforts, while bona fide, had been in vain, that the courts now look with favor upon the first locator who actually shows his good faith by diligent work—not merely the assessment work, but continuous and vigorous work performed daily until a discovery of a vein or ore deposit has actually been made. The conditions here described are preeminently exemplified in the oil regions, where a discovery of oil is practically impossible in most instances without boring a hole from the surface to the oil-bearing stratum, and the courts have protected the first locators who showed substantial evidence of good faith. The Mexican mining laws, framed to advance the mining industry and to promote the exploration of its mineral resources, are far ahead of those of the United States in this regard. There a citizen or resident may apply for exclusive permission to prospect a stated tract of land, and, if there be no legal reason why such permit should not be granted, the mining agent of the district surveys the tract selected and issues the desired permit to prospect and explore for minerals therein for a stated time. Having found mineral, the prospector may then denounce as many pertenencias as he desires to pay the tax upon. The advantage of the Mexican law is in the exclusive privilege which it gives to those who desire to comply with its stipulations.

## Dredger Tailings.

The controversy over the unsightly and useless piles of cobbles left in the wake of many dredgers, which has been going on for some time past, is likely to end in a more careful distribution of the tailings, so that the land, after dredging, may again be tilled with as good results as before. A dredger, the Champlin, operating on Foothills creek, in Jackson county, Or., is overcoming this vexing and somewhat sentimental problem by employing a distributing device, which leaves the tailings in the wake of the dredger smooth and almost in tillable condition. This is accomplished by means of a pump. Instead of discharging the coarse material astern and the fine over the side of the boat, thus leaving the land a succession of mud flats, dotted with ridges and heaps of cobbles, the Champlin dredger discharges all of the material together, as it is mined, leaving the land nearly as level as before.

The level distribution of tailings in the wake of a dredger is not a new idea by any means. Indeed, it was the only way in which it was accomplished at first. There are numerous dredgers working in other States where the tailings are left practically as level as the ground was before, and in some instances it has resulted in leveling the previously existing inequalities of ground which was rolling. These machines employ what is known as the extended adjustable sluice, which carries by far the larger percentage of material raised by the dredging buckets some distance astern of the dredging boat, discharging coarse and fine together 200 feet or more from the face of the bank being torn down by the buckets. The tailings stacker by means of which the ridges and heaps of cobbles are piled up is distinctly a California invention, and all California dredgers are thus equipped, though originally some of the large dredgers in that State had the extended sluices. Among the noted dredgers which leave a comparatively level plane of tailings in their wake are the A. F. Graeter, Graves, Cope, Maggie Gibson and Col. Gordon at Bannock, Mont.; the Conrey Placer Co. No. 2 at Ruby, Mont.; the Pacific Dredging Co.'s dredger at McNutt, Idaho; the Oro Dredging Co.'s boat at Elizabethtown, N. M.; the Atlin No. 1 at Atlin, B. C., and the above mentioned Champlin.

There would be a small gain in the possession of a salable tract of arable land after dredging, whereas by the present California method the land will remain practically useless for some years. Any effort to evenly distribute the dredger tailings must be made at a very low cost, and it must always be accomplished at no greater expense than that of handling the tailings by present methods, for the reason that the value of the land after dredging would bear a very small relation to the amount of gold being recovered. An acre of dredging land having an average depth of 31 feet contains nearly 50,000 cubic yards of gravel. If this land were salable after dredging at \$120 per acre, the ratio of expense which this amount of gravel would bear per cubic yard over the usual method of distributing the tailings would be but \$0.0024—a sum too small to entitle it to grave consideration when mining is carried on for profit.

THE demand for American mining, metallurgical, electrical and mechanical engineers for responsible positions in foreign countries continues. Not a week passes but American engineers leave for distant parts of the earth to assume control or to assist in the development of some new enterprise or to properly adjust an old one. It has long since been learned that the American engineer is not only capable under favorable circumstances, but he is versatile and equal to almost any emergency, and when conveniences do not exist he makes them on the spot—in other words, he can adapt himself to almost any situation, and what he lacks in natural resources of the country he improvises, or substitutes something as good or better than the usual practice.

RECENT concessions as to the levy of taxes on mining property, the cost of concessions, and other matters affecting mining operations in Mexico, are greatly appreciated by American and other foreign investors, and already the beneficent effect of this modification of the law is noticeable in the increased inquiry for mine investment in Mexico.



## CONCENTRATES.

ONLY rich mines can stand the disadvantage of bad management, and there are many such mines.

A PATENT to extract gold, silver and copper from ores by the ammonia cyanide process was issued to J. W. Simpson in July, 1885—patent No. 323,222.

THE best and most enduring "U" bolts for machine drills are made of cold rolled steel. This material is also the best for making rocker pins for machines.

THERE is a diversity of opinion as to the relative merits of wet or dry crushing of ores. With some ores wet crushing undoubtedly gives better results than with dry and vice versa.

IN all cases where the ore is amenable to amalgamation undoubtedly the best process is stamp milling with the usual practice adapted to the particular conditions, or the ore, locality, etc.

IN many cases where the ordinary "cross-bit" of a machine drill becomes fitchered and no further progress can be made without much loss of time, a chisel bit will often finish the hole without more trouble.

LEAD-SILVER BULLION is refined by electrolysis under patented processes, and is usually practiced in those districts from which it does not pay to ship out the lead. Such localities are rare, however.

IN Mexico a mine operator may drain his mine in any manner he may choose to adopt, but he is responsible for any damage or loss that may be occasioned in other neighboring mines from not properly draining his own property.

LITHOLOGY treats of rocks as mineral masses, and petrography is the science of the structure and chemical composition of rocks and of their individual minerals. The study is generally carried on with the aid of the microscope.

INVESTIGATION of fuels by the United States Geological Survey has shown that a ton of bituminous coal is capable of producing two and a half times as many heat units when producer gas is made from the coal as when it is burned in the usual way in the fire box of a boiler.

AIR COMPRESSORS are often provided with automatic governors, which regulate the operation of the machine, keeping the air pressure within certain limits as determined by the arrangement of the governor. The allowable variation in pressure generally ranges from 5 to 10 pounds per square inch.

GRANULAR pyrite often occurs in veins of high-grade ore, and is found to be practically valueless, the pyrite acting the same as gangue. This condition is found in numerous Colorado and Arizona mines. With the addition of zinc, lead or copper sulphides to the pyrite, gold and silver values generally appear also.

BY short circuit is meant a direct connection by accident or design of the positive and negative leads of a supply circuit or dynamo by a conductor of low resistance. This allows an excessive current to flow, which, owing to the heat produced, will fuse the leads and possibly overload the generator supplying the current and thus destroy its insulation.

WHERE a claim owner has applied for patent, but at the time the money should be paid into the land office he decides not to make payment, the patent will not issue, but the claim owner does not lose his possessory title to the claim by reason of such failure, as he can continue to hold it as long as he complies with the laws governing unpatented claims.

THE radiation from a furnace, of whatever type, is almost a constant quantity, no matter whether the walls be thick or thin nor whatever the material of their construction may be. Recent experiment has determined that reverberatory furnaces having thin walls—9 inches or thereabouts—lose no more heat by radiation than those having walls 24 to 30 inches in thickness.

WHERE ten stamps, of 1000 pounds weight each, are attached to one shaft, this shaft should be at least 6 inches diameter, and, if the stamps weigh more than 1000 pounds, the cam shaft should be increased in diameter to 6½ inches or more. Hammered high-grade iron is considered the best material from which to make cam shafts, although steel is generally used for this purpose.

COMPRESSED AIR may be used to operate a steam engine in lieu of steam without alteration if the exhaust ports are large. If they are not of good size they should be made so, or the escaping air will quickly cause the engine to "freeze up." This tendency may be reduced somewhat by discharging the exhaust under water, or better still, by reheating the air before sending it to the cylinder of the engine.

WHEN constructing a dam in a stream where it is not built securely on bedrock, it is very essential to provide against washing out of the base of the dam by the water flowing over the crest of the dam. In the construction of a large dam in San Diego county, Cal., the dam was built to such a height that the overflow passed over a low saddle between two adjacent hills on the bank of the artificial lake, so there was no possibility of the dam being undermined from overflow.

A MINING LOCATION may be made before a discovery has been made, but the actual existence of the claim will date from the discovery of the "mineral in place." Should a second party enter the claim so located and first discover mineral in place, the fact that the first party had already made a location without having a bona fide discovery will not save the claim to the first locator, as the discovery of mineral is the essential thing.

IN Alaska and the Klondike, where thawing of the ground is necessary in order to work the gold-bearing gravel, the difficulty arising from freezing of pipe connections when the steam was turned off was overcome by using graphite, which kept the pipes from rusting and making their disconnection convenient and easy. Graphite used on rubber gaskets where steam is used will always make it easy to remove the gasket when necessary, as it does not adhere to the pipe or boiler or other surface.

IN figuring the value of ores by assay, the commercial assay as ordinarily made is always meant, and not corrected assays. If the value of a shipment of ore is based on a corrected assay, where all losses by dusting, volatilization and absorption are taken into consideration, such computation will result in a misunderstanding with the ore buyers. The buyer's samples will not check with the seller's, and when the dispute is left to the umpire to make control assays the umpire's assays are more than likely to agree with those of the buyer than with those of the seller.

A MIXING oil cloth such as is commonly used in the assay office becomes a source of danger in creating inaccuracies in samples when the cloth becomes worn, having many cracks and small patches of enamel scaled off. Such a cloth should be thrown away, as it is no longer reliable. This is particularly the case where both high and low grade gold ores are being assayed. Where a low-grade sample follows a rich one there is great danger of salting the low-grade sample and too much pains and precautionary measures cannot be taken. Assays are useless unless they are accurate.

JIGS are of all sizes and shapes, from the small laboratory hand-operated machine to the large devices over 20 feet in length and 4 or 5 feet square. This latter size will handle 600 tons and over per twenty-four hours. Most jigs are provided with a piston which, operating vertically in the water compartment, transfers a pulsating motion to the water in adjoining screen compartments, and causes a grading of the mineral with regard to its specific gravity. The largest jigs are so arranged that the screens are operated directly by cam movements, and are also provided with side shaking device.

SECRETARY HITCHCOCK, Secretary of the Interior, recently decided that the work of prospecting a gravel claim with a drilling machine, by means of which bore holes are sunk at various points on the claim for the purpose of proving it, is an expense which may be properly charged to the annual assessment work required prior to patent. A reservoir and ditch built for the ultimate operation of a placer claim, are also properly chargeable to assessment work for the benefit of the claim. This decision was in the case of D. M. Vance v. T. L. and W. S. Adams at Jenny Lind, Calaveras county, Cal.

THE cost of smelting can only be estimated, even approximately, when the character of the ore to be treated is known; the proper fluxes required and their cost; the price of fuel and of labor, both skilled and unskilled, as well as size of plant. The region where the smelting is to be done is often an important factor. In some localities fuel is cheap, but fluxes are only obtainable at high cost; in others, the fluxes are at hand, but all fuel has to be shipped in. The size of the furnaces is important, as it is much cheaper to smelt in a large plant than in a small one. The cost of lead smelting under favorable conditions ranges from \$4.50 to \$7 per ton, and of copper from \$3.50 to \$8.

AN approximate computation of the capacity of an air compressor may be made by multiplying the area in square feet of the intake cylinder by twice the length of the stroke in feet, and this by the number of revolutions per minute when running at the usual speed, deduction being made for the piston area. This assumes that air is taken at each end of the cylinder. Of course this calculation is only approximate, due to slight imperfections of the valves, etc. If the valves do not close promptly at the proper time there is a loss of air. Valves which stick can often be successfully lubricated and kept in good condition by use of a little kerosene oil, applied with the usual machinery oil can.

THE Colorado State mining law contains the following: "All persons shall be prohibited from riding upon any

cage, skip or hucket loaded with tools, timber, powder or other material, except for the purpose of assisting in passing same through shaft or incline; and then only upon special signal." The law also requires all shafts to be divided into at least two compartments, one of which is for ladders, and in vertical shafts landings shall be constructed in the manway compartment not more than 20 feet apart, the landings to be covered except an opening large enough to permit the passage of a man, the ladders to be inclined at the most convenient angle the space available will allow. The ladders must be securely fastened and kept in good repair.

A NUMBER of ingenious devices are used to obtain samples from various depths in cyanide vats, particularly where slimes are being treated. It has been suggested that a bottle—similar to the laboratory distilled water bottle—be used for this purpose. The bottle, or jar, should be provided with a cork stopper through which passes two pipes, one extending nearly to the bottom of the bottle, the other being inserted only a short distance below the cork, and being, in fact, a vent. The other pipe is provided with a rubber hose of proper size weighted at its lower end, so that it may sink when lowered with the bottle into the pulp. The vent pipe extends upward from the top of the bottle as far as necessary to keep the upper end above the surface, and should be provided with a cock, to be kept closed when the bottle and hose are immersed until the desired depth has been reached, when it may be opened and the pulp will flow into the bottle, the air escaping through the vent. A device of this kind is useful to obtain samples of water from varying depths, and it may be found equally useful in securing pulp samples from variable depths.

THE group of elements known as the platinum metals are ruthenium, osmium, rhodium, iridium, palladium and platinum. Iron is also usually present. These several metals occur in nature nearly always as alloys, into the composition of which all of them usually enter. These metals do not occur abundantly, nor are they as widely disseminated as gold. Gold is usually associated with platinum, not always as an alloy, but accompanying it, due to the fact that gold veins occur usually in the same rocks as those which produce platinum, and both being of high specific gravity are found together in the placers. When gold occurs with platinum and the other metals it is recovered by dissolving the gold from the alloy. The process is based on the fact that gold is soluble in dilute aqua regia, while platinum is only soluble in concentrated aqua regia. Platonic chloride and iridium chloride form with ammonium chloride compounds which are soluble with difficulty. When the compounds are highly heated they are decomposed and the metals are left behind. When platinum-bearing sand has been recovered from sluices it is concentrated to get rid of the sand, etc., and the concentrate is boiled in dilute aqua regia, which dissolves out the gold. The residue is then boiled in concentrated aqua regia, which dissolves the platinum and usually also some iridium, leaving an alloy of iridium and osmium.

STRICTLY speaking, squatters, or other persons, have no right whatever on the mining ground located and properly held by others under the mineral land laws of the United States. In new mining camps where rich mines are being discovered and developed others than the claim owners usually rush in and pitch their tents on the first available spot regardless of ownership. This, under the laws, they have no right to do. Section 2322 of the Revised Statutes provides as follows: "Locators shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes or ledges, throughout their entire depth, the top, or apex, of which lies inside of such surface lines, etc." This section very clearly gives the locator exclusive dominion over the surface of his location, and it applies with equal force to placer or lode locations and millsites which have been properly located in accordance with the statutes, and this relation of the owner to the outsider obtains so long as the locator or his successor in right complies with all the requirements of the law. Although the law on this point is clear, it is sometimes expedient for the claim owner to make a concession whereby the surface of his claim may be used for the purposes of residence, or merchandising, etc., by others who have no interest whatever in the mineral rights. Convenience may require that city streets, as well as town lots, be staked out on the claims of the early prospectors. This procedure the claim owners may, at their option, obstruct, but it is usually the part of wisdom to permit the town to take a natural growth and to extend wherever circumstances dictate. To sell such rights may lead to cloud upon the mining title. At Tonopah, Nevada, the claim owners ceded their surface rights with certain reservations as a matter of expediency, and in order that there should be no adverse to the application for patent. The Supreme Court of the United States has decided that there can be no color of title in an occupant who does not hold under any instrument, preceeding or law purporting to transfer to him the title, or to give to him the right of possession. And there can be no such thing as good faith in an adverse holding, where the party knows that he has no title, and that under the law, which he is presumed to know, he can acquire none by his occupation.



## Mine Bell Signals.

TO THE EDITOR:—For the engineer, whose duties carry him to widely separated mining districts and perhaps States, the importance of adopting a uniform code of mine signals cannot be too strongly urged.

Of course a complete code of signals which would fulfil the want in one case could not be made applicable to all others, but there are a number of important signals, such as "hoist," "lower," and those required in handling men and in blasting, which are not affected by local conditions, and it is to these that reference is being made. It is almost generally understood in this country that the signal, 3 bells, means that men are to be hoisted. The writer has observed, in more than one instance, in the same district, the following signals employed for this purpose:

A mine, 3—1 bells. Hoist men.

B mine, 3 bells. Hoist men.

It can readily be seen what a dangerous practice it is to any one going from A to B mine, especially if not always accompanied by one familiar with the respective signals.

So it is with other signals, especially that used in blasting during shaft sinking.

In Mexico I think there is even greater carelessness in the use of mine signals than in this country. This is induced and, one might say, encouraged by the generally crude and slack methods attending the operations in a large number of cases.

In Johannesburg, Africa, a code of the important signals used in mining are embodied in the "Mining Regulations," and their use is rigidly enforced. I think it is generally acknowledged by men of African experience that the regulations covering the work of mining, as well as the use of boilers, are as comprehensive and complete as could be desired to meet the requirements of that country. The following quotations are taken from these regulations:

In signaling, the following shaft signals shall be used—  
1 bell, raise when engine is at rest.  
1 bell, stop when engine is in motion.  
2 bells, lower.  
3 bells, men about to ascend or descend.  
3 bells, in reply, men may enter the cage or other conveyance.  
5—2—1 bells, blasting signal.

In no case shall any person enter the cage or other conveyance until the back signal, 3 bells, has been given. The engine driver, when receiving the signal 1 bell or 2 bells (signifying to raise or lower any person), shall wait at least ten seconds before starting to wind.

The above code of signals, in the form of a distinctly legible notice painted on a board or enamelled plate, 22 inches high and 20 inches wide, shall be posted up in the engine room, at the top and bottom of the shaft, and at the intermediate shaft stations for the time being in use.

Special signals may be used at any mine, provided they are easily distinguishable by their sound or otherwise from the foregoing code, and do not interfere with it in any way.

In the above code the signal used in connection with hoisting men has been modified, and the return signal is no longer in use.

The blasting signal is applied as follows: When 5 bells are rung, the engine driver lifts the conveyance a distance of 10 feet, in order to see that the engine is at the time in working order. When the next 2 bells are given the skip or bucket is lowered to the bottom, then one bell is rung, to be hoisted away from danger.

The writer, some years ago, when on the executive of the Rhodesia Chamber of Mines, was called upon to investigate the question of mine signals then in use in that country with a view to recommending to the Government a code of signals to be embodied in the "Mineral Ordinance."

The result of this inquiry would have been ludicrous had it not disclosed such a dangerous state of affairs.

It was decided that the best course to pursue was to request each mine manager to furnish a code of signals which he considered would cover his requirements. From these contributions was compiled a code as simple and complete as possible—those signals which had to be adjusted to meet local conditions being left to the discretion of the individual managers.

In due course each manager was furnished with a printed code, accompanied with a request that they be immediately adopted and placed in the most conspicuous places.

In this country one is impressed with the importance of adopting some such similar action with regard to mine signals. It might also be advisable to consider the compilation of a mining ordinance, as well as boiler regulations, with a view to restricting operations to such an extent as to eliminate many of the risks attending gold mining as carried on at the present time.

In Africa, Australia and other countries mining inspectors are employed by the Government, whose duty it is to periodically visit the different mines in their respective districts and inspect the condition of the mines, as well as the surface equipment.

In our cities we have building inspectors and it appears to the writer that, in such an important mining country, the Government should offer some

assistance in the protection of those who are engaged in this latter industry.

F. C. ROBERTS.

Berkeley, Cal., May 2.

Realizing the importance of a uniform code of mine bell signals, the California Legislature adopted a code of bell signals several years ago, which is as follows:

1 bell, to hoist. (See Rule 2.)  
1 bell, to stop, if in motion.  
2 bells, to lower. (See Rule 2.)  
3 bells, man to be hoisted; run slow. (See Rule 2.)  
4 bells, start pump if not running, or stop pump if running.  
1—3 bells, start or stop air compressor.  
5 bells, send down tools. (See Rule 4.)  
6 bells, send down timbers. (See Rule 4.)  
7 bells, accident; move bucket or cage by verbal orders only.

1—4 bells, foreman wanted.  
2—1—1 bells, done hoisting until called.  
2—1—2 bells, done hoisting for the day.  
2—2—2 bells, change buckets from ore to water, or vice versa.

3—2—1 bells, ready to shoot in the shaft. (See Rule 3.)  
Engineer's signal that he is ready to hoist is to raise the bucket or cage 2 feet and lower it again. (See Rule 3.)  
Levels shall be designated and inserted in notice hereinafter mentioned. (See Rule 5.)

For the purpose of enforcing and properly understanding the above code of signals the following rules are hereby established:

RULE 1. In giving signals make strokes on bell at regular intervals. The bar (—) must take the same time as for one stroke of the bell, and no more. If timber, tools, the foreman, bucket, or cage are wanted to stop at any level in the mine, signal, by number of strokes on bell, the number of the level first before giving the signal for timber, tools, etc. Time between signals to be double bars (— —). Examples:  
6—5 would mean to stop at sixth level with tools.  
4—1—1—1—1 would mean to stop at fourth level, man on, hoist.

2—1—4 would mean stop at second level with foreman.

RULE 2. No person must get off or on the bucket or cage while the same is in motion. When men are to be hoisted, give the signal for men. Men must then get on the bucket or cage, then give the signal to hoist. Bell cord must be in reach of the men on bucket or cage at station.

RULE 3. After signal "Ready to shoot in shaft," engineer must give the signal when he is ready to hoist. Miners must then give the signal of "Men to be hoisted," then "spit fuse," get into the bucket, and give the signal to hoist.

RULE 4. All timber, tools, etc., "longer than the depth of the bucket," to be hoisted or lowered, must be securely lashed at the upper end to the cable. Miners must know they will ride up or down the shaft without catching on rocks or timbers and being thrown out.

RULE 5. The foreman will see that one printed sheet of these signals and rules for each level and one for the engine room are attached to a board not less than 12 inches wide by 36 inches long, and securely fasten the board up where signals can be easily read at the places above stated.

RULE 6. The above signals and rules must be obeyed. Any violation will be sufficient grounds for discharging the party or parties so doing. No person, company, corporation, or individual operating any mine within the State of California shall be responsible for accidents that may happen to men disobeying the above rules and signals. Said notice and rules shall be signed by the person or superintendent having charge of the mine, who shall designate the name of the corporation or owner of the mine.

Section 3 of the law says: "Any person or company failing to carry out any of the provisions of this Act shall be responsible for all damages arising to or incurred by any person working in said mine during the time of such failure."

The official code of Colorado is similar to that of California, but the several rules of that code differ slightly. For comparison the Colorado rules are given in full as follows:

Rule 1—In giving ordinary signals make strokes on bell at regular intervals. In signals similar to "Ready-to-Shoot" (3—2—1 bells), each bar (— —) must take the same time as each stroke of bell.

Rule 2—When men are to be hoisted or lowered, give the signal for "Men on, run slow" (3 bells). Men must then get on bucket or cage, then give signal to hoist, or lower (1 or 2 bells).

Rule 3—After signal "Ready to shoot" (3—2—1 bells), engineer must give signal that he is ready to hoist by raising and lowering bucket 2 feet. Miners must then give the signal "Men on" (3 bells), then "spit fuse," get on bucket or cage and give signal to hoist.

Rule 4—All timbers, tools, etc., "longer than the depth of bucket" or placed within a cage, must be securely lashed before being hoisted or lowered.

Rule 5—Signal of three (3) bells means "Men on, run slow," and nothing in conflict therewith will be allowed. Signals to meet local demands, and not in conflict with the above, may be added by individual operators, but the same must be posted in clear and legible form in connection with the above code.

### NOTICE.

Please observe the following, as they are imperative in order to comply with the law:

Don't get on bucket without first seeing that safety chain is properly hooked.

Don't get on cage or bucket without first signaling the engineer. Give 3 bells, then get on cage or bucket and ring 1 bell to hoist and 2 bells to lower.

Don't ride on loaded cage or bucket.

Don't ride on cage or bucket containing tools, timbers or explosives.

Don't load steel or timbers without first landing car or bucket.

Don't attempt to get on or off cage or bucket while in motion.

Don't leave guard rail thrown back.

Don't get in a hurry in signaling engineer; space your bells.

Don't work in ground you consider dangerous. Call your foreman's attention to the condition of the ground. Don't be careless, thereby endangering the lives of your fellow workmen.

Don't drill in an old hole or "gun."

Don't fail to thoroughly examine ground for missed shots before starting to drill, whether any misses are reported or not.

Don't attempt to pick out a missed shot.

Don't store explosives in excess of one day's supply under ground, but in magazine provided for that purpose.

Don't thaw powder except in powder trower, which must be provided for that purpose.

Don't use steel or a metal rod of any description for tamping.

More recently the Western Federation of Miners adopted a code which is in use in several localities, but that code, which follows, is not as good as that of either Colorado or California, as it appears to lack sufficient protection to the handling of men in the shaft. There is no signal to hoist or lower after the 3 bells are given. If men step on a skip or cage and merely ring these bells, they must depend on the engineer's judgment in giving them time to arrange themselves safely before starting.

The Western Federation code is as follows:

1 bell, hoist; 1 bell, stop (if in motion).  
2 bells, lower men; 3 bells, hoist men.  
4 bells, blasting signal. Engineer must answer by raising bucket or cage a few feet and letting it back slowly; then 1 bell, hoist men away from blast.  
5 bells, steam on; 6 bells, steam off.  
7 bells, air on; 8 bells, air off.  
3—2—2 bells, send down tools.  
9 bells, danger signal (fire, accident or other danger).  
Then ring number of station where danger exists.

No person shall ring any signal bell except the station tender, except in case of danger or when the main shaft is being sunk.

Engineers must slow up in passing stations when men are on the cage or bucket.

Here a lengthy combination of numbers is inserted indicating the several levels from the first to the twentieth.

If a cage is wanted, ring station. Station tender will respond in person.

If station is full of ore and station tender is wanted, ring station signal.

One copy of this code shall be posted on the gallows-frame and one before the engineer.

The first signal (one bell to hoist, or stop, if in motion) is in common use almost everywhere, and cannot be improved upon, but the signals "2 bells" lower men and "3 bells" hoist men are defective, as giving no premonitory warning, and make no distinction, so far as indicated by the published code, between men and materials. A better signal for lowering men is 3—2. This indicates that there are men to be lowered, whether it be from the surface or from some level to a level below it. If men wish to descend to any particular level, that level should be rung first, then 3—2. A hoisting signal for men, which has had years of trial is 3—1, or, hoisting with men from a level to any one above, the level first, then 3—1.

The clause requiring the engineer to slow up upon approaching each level seems superfluous and is prohibitory to rapid winding where large tonnage is hoisted daily through a single shaft, and would be unnecessary in a well-constructed shaft where there is competent and experienced management. The provision that the signal code shall be posted in the engine room and on the gallows-frame at the collar of the shaft should include the station at each level of the mine. It seems unfortunate that the signal code is not uniform throughout the United States, as then miners, who are migratory, would be familiar with it, no matter in what district they might be employed.

## Relation of Law to Underground Waters.

A report of great practical value, called "Relation of the Law to Underground Waters," by D. W. Johnson, has just been published by the United States Geological Survey as Water Supply and Irrigation Paper No. 122. It is the first comprehensive paper prepared in this country on the relation of the law to underground waters, and was compiled to meet a considerable demand for information on this subject. It is especially pertinent at this time, when active efforts are being made in several States to enact laws governing the use of underground waters which shall take account of the recent advances in the science of hydrology and the present knowledge of the occurrences and movements of such waters. The report is in no sense, however, a legal treatise, but rather the result of an endeavor to collect and arrange such legal decisions as will serve to show the relation of the law to problems which are essentially geological in character.

Mr. Johnson divides his discussion into two parts. In the first part he assembles the common-law rules



concerning underground waters; in the second he rehearses the legislative acts affecting underground waters. He divides underground waters into two classes, those flowing in defined and known channels, and those passing through the ground below the surface, either without definite channels or in courses which are unknown, and he arranges all the laws relating to underground waters under these two heads.

This report brings into striking relief the fact that there is a great lack of agreement among authorities on questions pertaining to underground waters. This is because there is so much that is uncertain and indefinite in the behavior of waters hidden beneath the surface. A second and very important reason for the unsatisfactory condition of the law relating to underground waters is found in the fact that the state of our knowledge regarding such water is now, thanks to the progress of geological science, in advance of the general ruling of the courts on some of the questions involved. Where a decision is controlled by opinions rendered in former cases, and not made with due regard to the present knowledge respecting subterranean conditions, it does not seem

### Concrete Mortar Blocks.

TO THE EDITOR:—In regard to your editorial on foundations for mortar blocks, I would suggest that anyone interested in the subject would be interested in examining the condition of the mortar blocks in the mill of the Royal Consolidated mines at Hodson, Calaveras county, Cal.

This mill of 120 stamps was built about two years ago and has cement foundations for the whole structure, including the crusher, line shafts, motors and mortars. The mortar blocks extend beyond the mortar front and back 12 inches. A rubber gasket is between the mortar and the cement.

The assistant manager, Mr. Unger, tells me no trouble whatever has been experienced with the cement mortar blocks, and moreover a personal examination showed them to be in perfect condition.

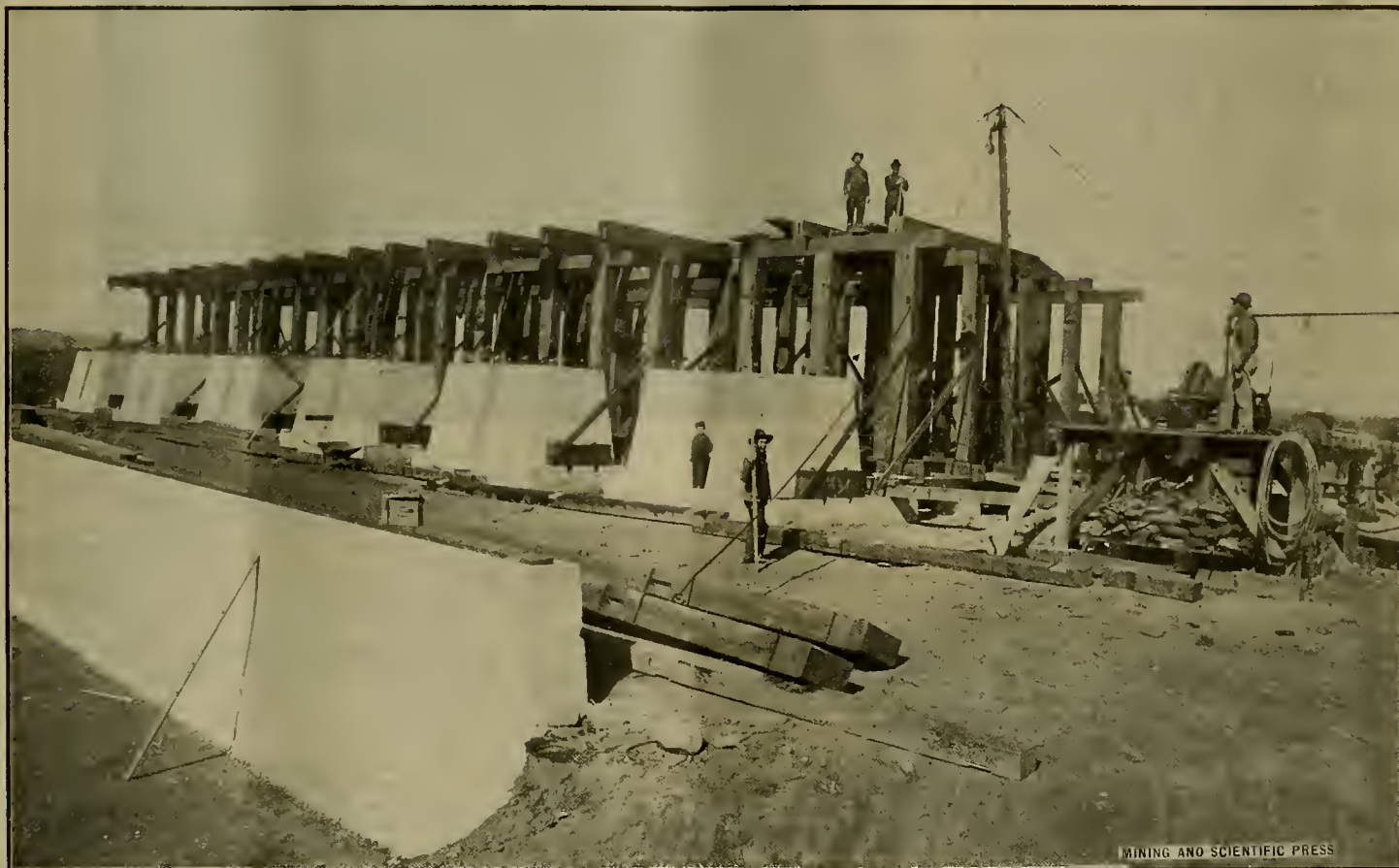
Owing to a number of breakages, the size of the cam shaft has been increased an inch (to 6½ inches).

The master mechanic has recently succeeded in welding the broken cam shafts and informs me that it pays. He has nothing extra in the blacksmith

\$10,000 to \$20,000 in a milling plant, it were best to spend a couple of hundred for a test to determine the character of the mill needed to crush the greatest amount of ore with the greatest saving, and if the cyanide process is necessary, the working details of it, so that instead of starting out blindfolded, as it were, one has some idea of how to work. I have no hesitation in saying that the additional saving in the first month in a mill which has had its ores tested by a competent man will more than pay the cost of such tests.

The general idea is only to get the mill up and the ore will do the rest; but often this is not so—the mill is put up, but perhaps is unsuited for the ore.

It is peculiar that the Easterners and often Californians, who would not think of putting up a factory except upon the most improved lines, will put up a ramshackle of a mill and expect dividends the first month. If it is lack of funds they had much better wait and put up a first-class mill, for otherwise they are courting failure. Nothing is too good for a stamp mill. Every piece of machinery or structure should be first-class; it means saving in repairs, and, what is as important, saving in time. All machinery



Concrete Mortar Blocks, Royal Con. Mill, Hodson, Cal.

that a just settlement of the controversy can be reached.

There probably must always be cases in which the subterranean conditions are indefinite or unknown, but the number of such cases will decrease with advance in geologic knowledge. The lack of agreement among legal authorities on many of the questions at issue is rather more fortunate than unfortunate in one respect at least, since it bears witness to the uncertain position of the law on the points involved and opens the way more readily for new knowledge concerning the problems, and a wiser interpretation of the law.

Mr. Johnson's paper is published for free distribution and may be obtained on application to the Director of the United States Geological Survey, Washington, D. C. It will prove of interest to mine owners who are developing water supply by means of wells and underground excavations.

ELECTRICITY is not a form of energy, any more than water is a form of energy, says Sir Oliver Lodge. Water may be a vehicle of energy when at a high level or in motion; so may electricity. Electricity cannot be manufactured, as heat can; it can only be moved from place to place, like water, and its energy must be in the form of motion or of strain. Electricity under strain constitutes charge; electricity in motion constitutes a current and magnetism; electricity in vibration constitutes light.

IN order to meet the cost of production, it has been found necessary to advance the wholesale price of the topographic maps published by the United States Geological Survey. Instead of costing \$2, the present price, 100 standard topographic atlas sheets will cost \$3 after June 30. The retail price of these maps will continue to be 5 cents a copy.

shop in the way of equipment, but makes an ordinary butt weld.

MARK R. LAMB.

San Francisco, Cal., May 8.

### Milling Gold Ores.

Written for the MINING AND SCIENTIFIC PRESS by  
ALGERNON DEL MAR.

The tendency of the times is toward fast crushing with often a consequent loss in the tailings, this loss being taken care of by a cyanide plant. So much is this the case that a word of warning may not go amiss. The cyanide plant is often not thought of until the results of fast crushing and poor amalgamation clearly shows the loss, often enough to cause a failure and the shutting down of the mill, for the cause is not perhaps apparent. It is now that the cyanide plant is rushed into place as a sure cure for all evils, often without any previous experimenting as to its fitness or its details, or if a cyanide plant does not appeal to the management a different style of crushing plant may be installed.

Fast crushing is all right in its place and where needed, but one must remember that the saving of the gold at lowest cost is important. There are some mines with practically an unlimited supply of low-grade ore which must be crushed as quickly as possible and where a loss of 25 or 50 cents a ton is compensated for by the increased tonnage. To this class of property triple discharge mortars, heavy stamps, low discharge and coarse screens are often undoubtedly the correct thing, but these mines are "few and far between." The great majority of mines now being opened are mines with a small ore body exposed and which must make a good showing from the beginning. Now, surely, before investing

should be purchased not for its cheapness, but for its fitness. There is nothing in continually hanging up a mill on account of defective machinery or running at a reduced speed on account of poor foundations. Have everything first-class from battery blocks to breakers, and don't forget the comfort of the amalgamators. They are human and don't like draughty buildings any more than the superintendent does; they do not yearn to be frozen in winter nor cooked in summer. The company that takes interest in the comfort of the millman will get a big return in extra care and attention which he will be able to bestow upon the machinery and the saving of the yellow metal. Take one small item for instance, that of keeping the cam shaft and the cams greased. There is a difference of about 3% to 4% in power from a well-attended cam shaft and a neglected one, not counting repairs caused by negligence. Now, in a cold, draughty mill, there is little inducement to leave the fire to save this 3%, but this item alone at the end of the year would be considerable. There are many other items which need not be mentioned. Perhaps this subject of the millman's comfort may be quite new to many mine managers, but I can assure them from personal experience it is an important one and too often sadly neglected.

A cyanide plant is a useful adjunct to a mill in cases, but a simple change in the details of the battery amalgamation may obviate its necessity. Find out where the values are escaping, whether in the fine or coarse material, and change the screen or take care of the gold-bearing tailings accordingly. Sometimes a change of screen to a coarser mesh will not only increase the tonnage, but lessen the values escaping; sometimes it is best to change to a finer mesh screen and crush less, but save more. Experiment and find out. Do not be content to have a mill and see it running, but have the mill save the great



est amount of gold at the least cost and then enjoy seeing it running.

Particularly a fast crushing mill should not be installed until it is determined whether the gold can be saved as fast as the ore is crushed, for a change to the ordinary old reliable five-stamp mortars may be a necessary step to saving values which otherwise escape.

### Precipitation of Gold and Silver From Cyanide Solutions.\*

NUMBER III—CONCLUDED.

Written by W. J. SHARWOOD.

It has been shown by others dealing with zinc shavings that the zinc does not accumulate in the solutions to any great extent, and that after a month or two the solutions do not change much in composition, even when used for several years. This is also true with zinc dust, as is shown by the following analyses, representing an experience of six months. It will be noticed, however, that the percentage of zinc in solution increased when the percentage of cyanide in the working solution was raised:

#### VARIATION IN COMPOSITION OF A CYANIDE SOLUTION WHEN PRECIPITATED BY ZINC DUST.

Number of days in use.....	0	10	40	70	100	130	160	190
Working strength KCN, % ..	.15	.10	.09	.09	.10	.10	.12	.12
Zinc, % .....	.034	.028	.025	.028	.032	.054	.050	
Copper, % .....	.030	.066	.066	.070	.071	.066	.073	
Lime, % .....	.081	.091	.089	.100	.096	.082	.088	
Solid residue, % .....	.50	.56	.57	.67	.68	.60	.66	

Two men in one shift can easily clean up a press containing a ton of precipitate, and recloth it for use again. The cloths can be used for months, if they are protected by being covered with a light, cheap fabric, which can be stripped off and burned at the cleanup.

The following table shows the results obtained at some typical plants using zinc shavings and dust. The figures all represent experiences with thousands of tons of material. As a pound of zinc under ideal conditions should precipitate either 6 pounds (87 troy ounces) of gold, 3.3 pounds (48 troy ounces) of silver, or 1.95 pound (28 troy ounces) of copper, it is evident that the actual efficiency obtained in these instances is a very small fraction of the theoretical efficiency. This theoretical efficiency can only be approached when a rich solution is treated with a very small amount of zinc. On the other hand, it can be seen from the figures under "Percentage of Zinc Dissolved" that a large proportion, ranging from 16% to 60%, of the zinc remained undissolved in the precipitating boxes or presses. The percentage remaining undissolved is smaller when the solutions are strong and highly alkaline, when the proportion of solution to zinc is large, and when the period between cleanups is long. Two of these examples are from published statements; for some of the others I am indebted to several metallurgists who have kindly furnished me with valuable data.

#### RESULTS OBTAINED WITH ZINC PRECIPITATION IN UNITED STATES AND MEXICAN PRACTICE.

Material Treated at Plant.	Form of Zinc Used.	Percentage of KCN.	Average strength of solution when precipitated. Percent KCN.	Number of tons solution precipitated by one pound of zinc.	Percentage of zinc dissolved.	Number of Troy ounces precipitated by one pound of zinc.	Gold.	Silver.	Copper.
Sands, gold and silver.	Shavings	0.32	1.5	84	0.31	0.56	.....	.....	.....
Slime, gold and silver.	Shavings	0.04	5.	37	0.25	0.5	.....	.....	.....
Rich gold ore.	Shavings	0.5	1.1	40	1.100	0.10	.....	.....	.....
Mixed tailings, gold.	Shavings	0.1	3.3	60	0.700	0.01	Trace	.....	.....
Sand, gold and silver.	Shavings	0.2	3.2	79	0.16	3.19	None	.....	.....
Mixed tailings, gold and silver.	Dust.	0.1	2.	30	0.35	0.70	None	.....	.....
Low-grade sand, gold.	Dust	0.06	5.	84	0.700	0.30	.....	.....	.....
Mixed tailings, gold and silver.	Dust.	0.08	3.5	60	0.31	2.08	0.75	.....	.....
Low-grade slime, gold and silver.	Dust.	0.033	5.	66	0.12	0.83	1.20	.....	.....

In the last instance it was found possible to precipitate over 95% of the values from solutions which carried less than 50 cents gold and 10 cents silver per ton, with about 0.03% of free potassium cyanide. It is probable that the presence of copper had a favoring influence, but the result shows the zinc dust process to be as well adapted as the electrolytic to the precipitation of low-grade slimes solutions.

Some experiments were made on a solution carrying about \$2.50 in gold and 20 cents silver value per ton, together with 0.015% copper and 0.05% of free cyanide. One portion was treated with hydrogen sulphide until saturated; another was made distinctly acid and then allowed to stand until the precipitate of silver and copper cyanide settled, when it was filtered. Other portions were electrolyzed. It was found that precipitation was far from complete unless the current was allowed to act for a very long time, and the surface of the lead plates used was very large in proportion to the volume of solution. When this was done all traces of the gold and silver and copper were removed. Other portions were agitated with zinc dust at the rate of one-fourth pound per ton, without filter pressing, and others filter pressed.



Automatic Dumping Skips at the Pewabic Mine, Central City, Colo. (See Page 294)

#### EXPERIMENTS ON PRECIPITATION.

Method of Precipitation.	Percentage of Contents Precipitated.		
	Gold	Silver	Copper
Saturation with hydrogen sulphide.....	28	97	3
Acidulation .....	65	90	75
Electrolysis for 24 hours .....	100	100	100
Agitation 15 minutes with zinc dust ..	25	60	3
Agitation with zinc dust and filter pressing.	94	97	4

#### SIX MONTHS' EXPERIENCE WITH SIMILAR SOLUTIONS, USING ZINC DUST AND FILTER PRESSING.

KCN averaging 0.04% .....	98 to 99	Over 96	2 to 4
KCN from 0.08% to 0.1% .....	98 to 99	Over 96	0.5 to 1

These figures bring out the fact that silver is, as a rule, easier to precipitate than gold, just as it is slower to dissolve in cyanide solutions. Another instance of this was seen at a plant where it was at one time the practice to allow the values in the "strong solution" to accumulate for a week or more (there being more silver than gold), while the "weak solution" was always precipitated. The solution was sometimes made up to the required strength by putting a certain weight of the cyanide in lump form on the surface of the sand in the leaching vats, and then running on a measured amount of solution. This is not a very satisfactory method, but answered fairly well except when cyanide from a certain consignment was used, when a black deposit was always observed on the surface of the sand. This deposit for the most part redissolved in the course of a few hours. On examination it proved to be nearly pure silver sulphide, carrying a little gold and copper, while this particular brand of cyanide was found to contain an unusual proportion of alkaline sulphide. The trouble was prevented by using a purer brand of cyanide, or by precipitating the solution more frequently.

It is impossible to draw any general comparison between the merits of the different zinc and electrolytic methods of precipitation, but the following figures are based on practical results with material of moderately low value, all being calculated to a standard of 100 tons solution precipitated per day.

Electrolysis: Precipitating tank of 1200 cubic feet capacity for 100 tons solution daily—say, a box 10x5x24 feet—having about 3000 square feet each of anode and cathode surface. This would require 5 H. P. or 6 H. P. to produce current, in addition to the power for pumping. The actual precipitation obtained at two plants averages very close to 90% of the values in solution.

Zinc shavings: One hundred tons solution per day require about 100 cubic feet of capacity for the zinc, or about 175 gross cubic feet of zinc boxes—say, two boxes 2 feet by 2 feet 9 inches by 16 feet, using twenty-five to thirty pounds of zinc per day, the only power required being for pumping solution and turning zinc.

The actual precipitation obtained may be taken at 90% to 95% under favorable circumstances.

Zinc dust: One filter press, with sixteen frames about 2 feet square, would precipitate 100 tons, working not over fifteen or sixteen hours per day, and would require about 2 H. P. during that time—neglecting any additional friction in pumps in excess of the power required for pumping solution from sumps in the last case. Some power is also needed for stirring or agitating solution when adding zinc, but this is only for a few minutes at a time. The percentage of precious metals precipitated at two plants ranges from 95% to over 98%, from twenty to thirty pounds zinc dust being used per 100 tons.

Owing to the greater cost of the machinery required for the electrolytic and zinc dust processes, it is evident that the zinc shavings system is by far the best adapted to all small or temporary plants; but with installations intended to treat 100 tons or more per day, or likely to be in use for several years, the merits of the other systems should be considered.

SOME MODIFICATIONS OF THE CYANIDE PROCESS.—These notes are added in answer to a number of questions which have been asked of the writer since the title of this paper was announced.

The Pelatan-Clerici process was intended to render unnecessary the separation of the solution from the ore or tailings; these were to be agitated with the cyanide solution, while the precious metals were to be precipitated by electricity at the same time that dissolving was taking place; the gold was deposited on amalgamated copper plates attached to the bottom or sides of the tank, or suspended in it; common salt was added to the solution to increase the conductivity. It was tried at several mines in the United States, but for some reason or other was discontinued at each of them, and is only mentioned here on account of the resemblance which some more recent processes bear to it. The Riecken process, introduced into Australia, has a horizontal agitating shaft, the gold being similarly deposited by electrolysis during the agitation of the pulp, while a stream of quick-silver is kept flowing over the cathode plant. The Hendryx process also closely resembles the Pelatan-Clerici.

Two processes in use on rich ores in Western Australia are of interest, as both involve the use of the filter press to separate the solution, and also the practice of fine grinding in flint mills, which was discussed by Prof. S. B. Christy at the 1903 meeting of this Association, and which is coming into favor for certain classes of material. The Marriner process consists in first roasting the ore, fine grinding, agitating with cyanide solution, filter-pressing the pulp and precipitating the solution with zinc. The Diehl process consists in first grinding the ore fine, then agitating with bromo-cyanide, filter-pressing the pulp and precipitating. The working costs of each appear to be about \$5 per ton, the expense of bromo-cyanide in the one case being offset by that of roasting in the other.



## New System of Haulage Adapted to Heavy Grades.

Written for the MINING AND SCIENTIFIC PRESS by  
BENEDICT SHUBART.

Since the first installation of electric haulage it is fair to say that little has been done toward improving the old method of getting tractive effort from the friction due to the weight of a heavy locomotive on a smooth track. This has limited the field of the electric locomotive in mine work particularly, where grades are often beyond the safe limit of traction. In many mines there are still complex systems of ropes and drum hoists, making it necessary to couple and uncouple the trip several times before it reaches the open, and proving a constant source of expense and delay.

E. C. Morgan, who has been a pioneer in the design of electrical machinery for mining work, realized some years ago that there was a field as yet unoccupied, and bent his energy upon the perfection of a system of locomotive haulage that would do what a rope could do. The result has been the Morgan system of third-rail haulage. The Goodman Manufacturing Co. of Chicago has taken over Mr. Morgan's interests and are adding their experience to his. This change will doubtless result in a stronger and better machine than the original.

The present form of the third rail is the result of the best efforts of both companies.

Roughly speaking, the third rail system consists of a perforated rack fastened parallel to the rails, a sprocket wheel meshing in the rack, and the necessary motors for driving the sprocket wheel.

Cut No. 1 shows a sectional view of the third rail and track. Wooden stringers H, impregnated with a waterproof insulating solution, are laid upon the ties 5 inches off center to allow the miners room to walk along the track. Upon these are laid cross blocks of correct thickness to give the proper height to the impregnated strips on which is laid the third rail G. This is a strip of Swede's iron, approxi-

the sprocket wheel. This makes it impossible to come in contact with the charged third rail, except with deliberate intent. There is no record of an accident from contact with the charged rail.

The sprocket wheel is also insulated from the frame and wheels of the locomotive. Current is taken from the sprocket wheels by two brushes and the T rails



Fig. 4.—The Third-Rail Track.

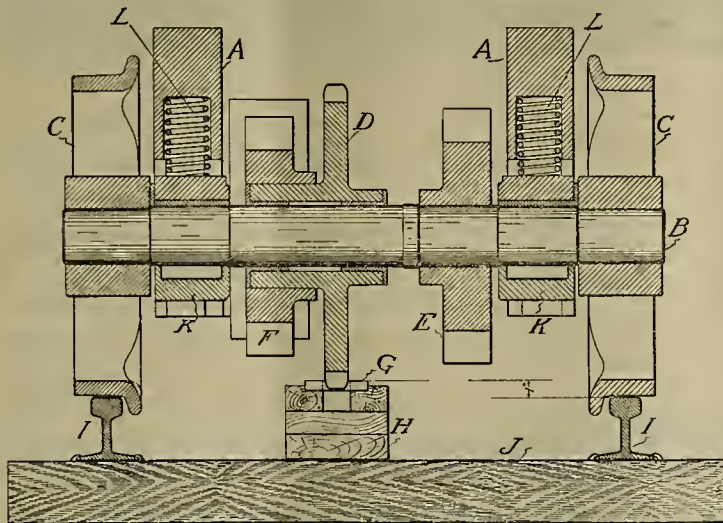


Fig. 1.—Sectional View of Third Rail and Track.

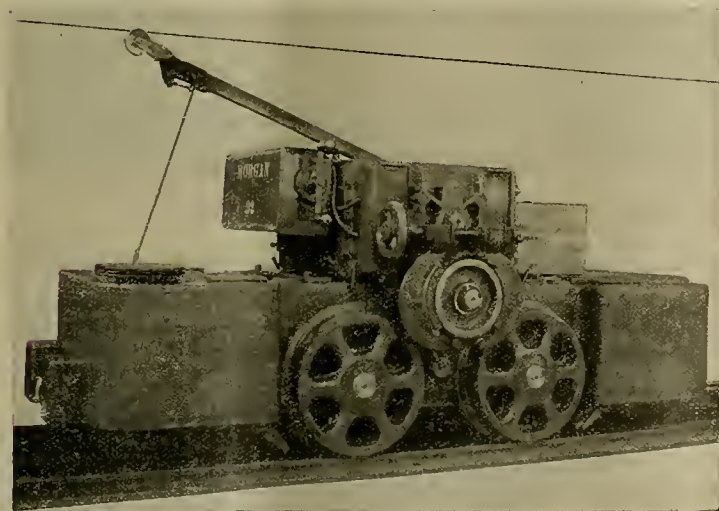


Fig. 2.—The Morgan Locomotive.

mately  $4\frac{1}{2} \times \frac{3}{4}$  inches, cross section with accurately spaced square perforations, into which mesh the sprockets D. As in many installations the third rail carries the current to save the expense of trolley wire, it is necessary to make the third rail as safe as the ordinary track. To this end impregnated strips, not shown in the cut, are laid lengthwise along the third rail, leaving only a narrow slot for

are used for the return circuit as with the trolley locomotives.

The advantages claimed for the Morgan third-rail system are many. But first and foremost is the claim that almost any reasonable grade can be safely overcome in ordinary mining work. Grades as high as 20% are being operated at present, though this is a harder grade than should be attempted.

The Morgan third-rail is a positive haul. The difference between a Morgan locomotive and a traction locomotive is exactly the difference between a pair of spur gears and a pair of friction gears. One is positive and can be depended upon to drive; the other may slip at a critical point and do considerable damage. When the current is turned on in a Morgan locomotive it must start. Wet or greasy rails cannot hold it. Heavy grades cannot make it slip. And when the powerful screw brake is set it must stop. There is no skidding of a trip down a heavy grade beyond the control of the motorman.

Naturally there is no need of sand with this system. In the course of a year the expense of sand is an item to be considered, together with the annoyance of sanding machinery and extra wear on track and wheels.

A 25-ton traction locomotive has that excessive weight merely to gain friction on the track. A type "BB" Morgan locomotive weighs only  $4\frac{1}{2}$  tons, and yet has the same hauling capacity as the large traction machine. This means a saving of 20 tons of dead metal which need not be hauled about with every move of the locomotive. Conversely it means a gain of 20 tons of load in hauling capacity over a traction locomotive, with no greater expenditure of power. Or, a Morgan type "BB" locomotive will haul a 20-ton load with the same current that a traction locomotive uses in moving itself about.

Fig. 2 shows a Morgan third-rail locomotive of the latest type recently put into operation at the mines of the Barnard & Saginaw Coal Co. at Saginaw, Mich. This is an 80 H. P. motor, with a drawbar pull of 6000 pounds. The locomotive is built to run as a third-rail motor on the heavy grades and as a traction motor on the levels. Its weight is unusually heavy to secure tractive effort where the third rail is not laid.

At the mines of the Collins Colliery Co. at Glen Jean, West Va., the heavy grades necessitated the design of special locomotives. The equipment consists of two standard "BB" motors, and one each type 2B and type 4B motors. Fig. 3 shows the two special locomotives. It is evident that the 2B motor is made of two type "B" motors coupled together, and operated from one controller. Similarly the 4B locomotive is made of four type "B" motors. The motorman's station is midway of the length in each case, his seat, the controller and motor driven air brake pump being mounted there upon a suitable platform carried by the frames of the adjacent sections of the locomotive.

The starting drawbar pull of the two locomotives are 12,000 pounds and 24,000 pounds respectively.

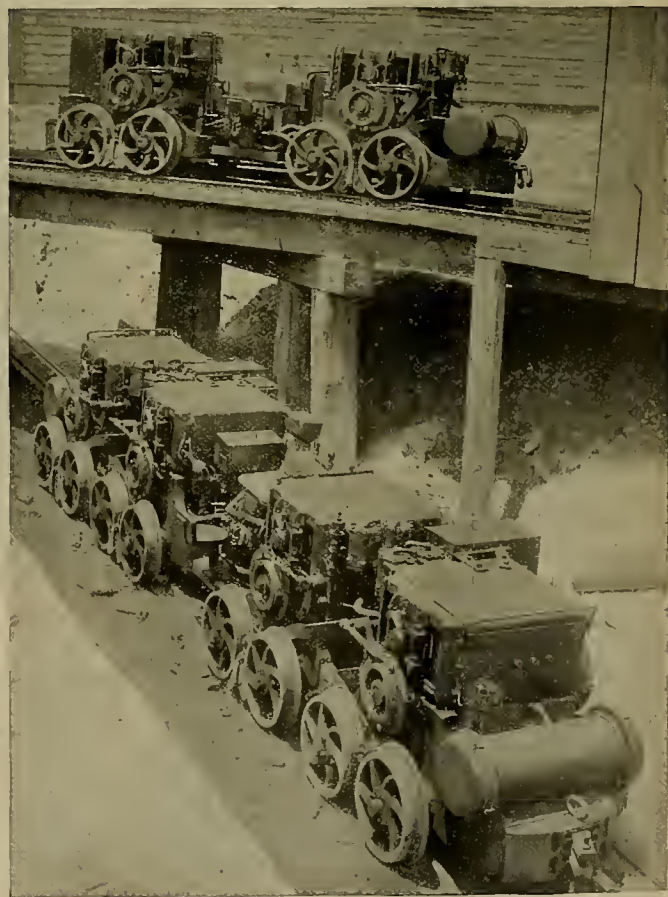


Fig. 3.—Special Locomotives.

The weight of a traction locomotive equal to the larger machine would be 60 tons, whereas the weight of the Morgan locomotive is only 16 tons, and the weight on each wheel is but slightly more than the weight per wheel on the mine cars. Thus the Collins Colliery Co. were able to use their old track, whereas the adoption of traction motors would have meant relaying the entire trackage. Fig. 4 shows a por-



tion of the track where the 4B locomotive is hauling a load of 55 tons up a grade of 8%. The rear of the trip is in view at the head of the grade and the horse standing upon the track shows the safety of the insulation of the third-rail system. The trip was stopped half way around the curve so a photograph could be taken. Then the trip started on its upward path without hesitation, or even backing, to get the slack of the trip.

The remarkable success of the third-rail system induced the Goodman Manufacturing Co. first to exploit the sales and then to acquire the entire rights and manufacture of the machinery.

The Auditing of Ore Reserves.

In discussion of a paper read by B. I. Collings before the Chemical, Metallurgical and Mining Society of South Africa, H. L. Leopold said, at a recent meeting of that society, that he did not believe the "auditing" of mine sampling by another person would have the expected results ascribed by Mr. Collings to that idea. The following is abstracted from the remarks of Mr. Leopold:

In auditing ore reserves, several factors have to be considered, each of which requires careful investigation. But although a correct valuation of a mining property could not be made neglecting a single one of these, yet there is one of them which gives a great deal more trouble to the mining engineer than all the rest combined. I mean sampling. Proper sampling is an art, like any other, and a man who goes to his work with the idea that there is nothing easier than sampling had better not start at all. My opinion is that a sampler ought to be a man with a certain amount of technical education, be this education acquired at a school of mines or through years' experience in mines. He should have a keen, observing eye, a great deal of good sense, and take a lively interest in the work he does. A man with knowledge of geology, mineralogy, surveying and assaying should be given a preference, even if he has no underground experience. I think that these subjects and sampling are very intimately connected. To show that others think the same, I may quote the words of a well-known mine manager of the Eastern Rand, who said that a man cannot properly survey a reef unless he can sample it correctly. That gentleman was quite right. Only a sampler who has the above-named knowledge can be of effective assistance to the mine captain or surveyor.

We all know by experience that a reef has never exactly the same value over a great area and seldom the same width. We further know that some reefs carry the gold regularly and finely divided, but we also know that very often the reef is patchy. Other reefs carry the gold in coarse grains pretty equally distributed; some others, again, have the coarse gold in patches or zones. In the first and third instances there are not many chances for discrepancies if two independently taken samples are compared. But in cases two and four the results would almost always differ, and sometimes very considerably so.

Further, in development work (drives, winzes, etc.) samples are usually taken in the face and the assays entered on plan, and averages based on these figures. Check samples, on the contrary, would have to be taken by the auditor from the right or left wall, or from both, and we all know how much these differ. It would then remain to be decided whether the series of figures found by the auditor or that of the sampler, who knows the structure of the reefs by daily experience, is the more correct one. If I were asked what I thought would be the best method to check a sampler's work, I should say: Accompany him on his round and see that he takes his samples and measurements correctly from hanging to foot-wall, observing not only the dip—as many samplers think sufficient—but also the strike. Every other method of checking, especially in stopes, is ineffective.

I am very much tempted to draw a comparison between sampling and hoisting. Managers feel uneasy about the correct sampling of their properties, and look for a safety catch, but it has to be proved if the catch will act as and when required. Now the best safety in hoisting lies in a good rope, and to avoid serious discrepancies in the estimating of ore reserves, and the valuing of mining properties generally, a painstaking and reliable sampler affords the best security. Some mine managements have adopted the scheme of starting educated and energetic young men as samplers, and I daresay that this method promises to be the method of the future, as it has up to the present proved to be a complete success. For the young man who wishes to go ahead there need be no fear of an auditor coming to check his samples, as there is always the spur of ambition which keeps such a sampler from neglecting the precautions required to turn out a good day's work.

In sampling, just as in any other profession, it is not the quantity which gives credit, but the quality. I know by experience that from twenty to thirty samples is a very good day's work if they are taken accurately. Naturally, the number varies according to the locality and the nature of the rock. But the sampler's work is not done when he has taken the



Fairbanks, Alaska, Metropolis of the Tanana. (See Page 307.)

samples underground. Almost the same amount of trouble awaits him in the crushing house, where he has always to keep an eye on his samples and to take great care to carefully blow out the grinders after every sample. The most important job after the taking of the sample underground is undoubtedly the mixing, and many discrepancies in the estimating of ore reserves are due to the bad mixing of the samples which are sent in for assay.

Some time ago C. W. Lee, chief assayer at the Jumpers Deep, pointed out that samples, if not ground fine enough, would allow the gold to concentrate on the mixing cloth and, therefore, give inaccurate assay results. This is an undoubted fact, but I have found that even finely ground samples show a concentration towards the bottom if allowed to stand after the mixing. This concentration is most likely due to the fact that a sampling house is generally vibrating slightly, owing to machinery in motion near by. This vibration is, of course, transmitted to the shelves where the bags with the samples are.

Some samplers certainly would protest most emphatically if they were called inaccurate simply for pouring part of a ground sample from the big bag into a smaller one which is sent in for assay. Others are more accurate and mix their samples by rolling them on the cloth and afterwards spread them more or less evenly and take from different parts of the flattened heap the amount required for assay. This method, although the better of the two mentioned, is far from being accurate. The method called "quartering" is well known to all of us, so that I need not explain it further. At any rate, I find that quartering is best for, especially, important samples; it takes too much time for ordinary work.

I have, therefore, devised another method to quickly obtain a thorough, even sample. Rolling alone will not be sufficient, because of the gold concentrating on the cloth, though I do not condemn the use of the cloth, but its abuse. To mix properly, proceed as follows, using a scoop and cloth combined. Pour samples onto cloth, cross cut with the scoop through the heap in several directions, always throwing the lot on the scoop to the right and left alternately; roll a few times and repeat the above proceeding—the oftener the better. Flatten the heap into a fairly even layer about 1/2 inch thick, divide by cross lines, and take alternate squares, as on a chess board. If necessary, repeat to reduce to a convenient size. This quantity you treat as you did the whole before, and take from the equally spread layer what you want to send in for assay, always having the precaution to take equal parts from top and bottom of this layer. What remains on the cloth will be the best check sample.

I have put together some results taken from actual practice, which will clearly show a good sample can be totally spoiled by bad mixing. Of every sample three lots were assayed, fractions of pennyweights not being given:

MIXING WITH CLOTH ALONE (ROLLING).

PENNYWEIGHTS												
	1	2	3	4	5	6	7	8	9	10	11	12
1.....	117	44	13	6	8	19	12	26	58	15	16	6
2.....	130	42	15	9	10	18	9	23	54	11	10	2
3.....	112	46	16	9	11	11	16	22	59	12	21	8

MIXING WITH SCOOP AND CLOTH.

PENNYWEIGHTS												
	13	14	15	16	17	18	19	20	21	22	23	24
1.....	12	5	15	15	9	10	21	20	26	7	11	56
2.....	11	5	16	15	9	11	21	20	26	7	11	56
3.....	12	5	16	15	9	11	21	19	25	7	10	53

As will be seen, the results obtained by the first method are quite unreliable, while those taken by my method are strikingly uniform.

To prove that there is no concentration of gold on the cloth, if the sample be mixed properly, I have made the following experiments. I took from the mixed sample the whole of the top layer in three portions, without, as usual, including the bottom layer. These I sent in for assay, as well as the part remain-

ing immediately on the cloth. The results proved very satisfactory indeed. They are as follows:

PENNYWEIGHTS					
	1	2	3	4	5
1—Top layer.....	5	11	12	17	5
2—Top layer.....	5	11	11	17	5
3—Top layer.....	5	10	12	17	5
Bottom layer.....	3	11	12	17	5

You will notice that the slight variations in the results from my method of mixing cannot be due to concentration, as they are all below the average. These, the assayer assures me, are due to loss through absorption during cupellation, the buttons not being parted. It is hardly necessary to point out how impossible it is for the monthly returns to correspond to the calculated figures when assays may differ by four pennyweights or more, owing to faulty mixing.

To conclude, I would like to suggest that the schools of mines in England, America and on the Continent should pay much more attention to sampling than they do at the present time. A young mining engineer may spoil his career through lack of knowledge in sampling, and, therefore, I hope that soon all schools of mines may give it the importance it deserves.

THE PROSPECTOR.

The rocks from North Yamhill, Or., have been identified as follows: No. 1 is graywacke (a peculiar sandstone). No. 2 is an altered and silicified dike rock in which is much disseminated pyrite. No. 3, obsidian (volcanic glass). No. 4 is apparently a piece of petrified wood, which was originally a portion of a tree buried in the lava. No. 5 consists chiefly of small fragments of feldspar and quartz cemented by indurated clay. No. 6, volcanic glass, containing many spherules, and is undergoing devitrification. Any metal obtained by heating in the forge, as claimed, is probably iron. No. 7, volcanic tuff. No. 8 and No. 9, vitrophyre (volcanic glass). No. 10 is much altered granular rock, in which quartz grains and kaolinized feldspar are noticeable. The green mineral is iron silicate. The rock is so much altered as to make its original character indeterminable. No. 11, volcanic tuff, with fragments of basic lava. No. 12, quartz, carrying considerable galena, a little zinc sulphide (blende), and stains of iron and copper. This should contain also silver and gold. No. 13, quartz and talc, stained by green copper carbonate; may also contain gold. It is practically talc schist, with veinlets of quartz. No. 14, bluish quartz, with abundance of pyrite and marcasite, both iron sulphides. Rock of this description is often very rich in gold, but not always free milling. No. 15, chalcedonic quartz, stained red by iron oxide—hematite. Rocks of this character are occasionally gold bearing. No. 16 is largely composed of chlorite, and is undoubtedly an altered greenstone. There is considerable iron oxide present. It is not necessarily a vein mineral, but may occur in a zone of mineralization. No. 17, iron-stained clay, seemingly a very much altered greenstone, such as diabase or diorite. Such rocks are often gold bearing at and near the surface, but in depth the values are likely to become low grade or disappear entirely from the country rock, though seams of quartz or lime (calcite) occurring in them may be found rich in gold in depth.

The rocks from Good Springs, Nev., are: No 1 (black), brecciated limestone recemented by calcium carbonate and containing considerable iron; No. 2, iron-stained quartz with granular structure, probably replacement of limestone. This may contain gold or silver; No. 3 (white), calcite, crystallized limestone.



## Oil and Asphaltum on the Shores of Great Salt Lake, Utah.

Written for the MINING AND SCIENTIFIC PRESS by  
DON MAGUIRE.

Wyoming and Colorado promise to make great additions to the field of America's oil region. For more than twenty years—that part of Colorado around Florence has been a profitable field of production and other parts of that State promise to become more prolific than the Florence district. In Wyoming oil and asphaltum should be abundant. As far back as 1812, "tar springs" were known in Wyoming. From present indications, based on the work of prospecting, Wyoming is destined to become one of the great oil fields of the world; western Wyoming especially shows evidence of its existence.

of faulting in our country. Originally the valley of Great Salt Lake was a deep basin. At present its surface is 4200 feet above sea level where formerly it was only about 2000 feet above sea level. In other words, we find now 2200 feet of sediment lying between the bottom of the waters of the lake and the point where the oil drill shows rock in place. This depth refers to that part of Salt Lake basin lying between the east shores of the lake and New Foundland butte, that rises out of the desert 15 miles west of the lake shore. Underneath this vast depth of soft sediment, carried from the regions surrounding the great basin during recent geological time, lie the rocks that in other localities form the casing for extensive oil deposits.

For upwards of thirty years natural gas has been known to exist in this area and at Salt Lake City this was utilized for about five years, but in a limited way, as the pressure does not seem to have been sufficiently continuous to make its use satisfactory—

Bonneville shore line, is found a clay that on being exposed to great heat will give an odor similar to heated asphaltum. This barren condition does not, however, exist all over the Salt Lake basin, for in the northwest region of the lake—taking that part of the water area that lies west of the Promontory mountains where the waters of the lake of late years have receded far within their former meander line—we find an oil and asphaltum field covering an area of about 150 miles.

For ten years reports were heard that asphaltum had been discovered south of Promontory on the lake shore, but no persons of prominence in the mining world gave credence to them. About thirty years ago I visited that margin of the lake, but, as in those days, the waters of the lake reached much farther to the north than they do at the present day. They washed a shore where there is nothing but basalt, and, knowing this, when reports of oil and asphaltum discoveries were made, they were not believed. Persistent statements continued to be made and the writer in November, 1903, in company with others, visited the reported site of these discoveries to find that the lake had receded far beyond the old meander line, exposing a wide stretch of country free from lava, and that along the lake shore and far out into the lake, a number of small islets served as vents for asphaltum exudations. There are about 100 of these scattered up and down the lake shore for a distance of 10 miles and extending into the shallow waters of the lake; they either show their crests above the surface or appear plainly, rising from the lake bottom below, as in all places where either oil or asphaltum is found by a lake or sea shore we find rolls and masses of sand asphaltum along this part of the shore of Great Salt Lake. The quantity of asphaltum existing at any of these vents is not large. Where a limited amount of work had been done some years ago, and a cylinder formed from a section of a steam boiler had been driven down, we found a volume of viscous asphaltum equivalent to about ten barrels. At each of the other islets or vents from a few gallons to perhaps a barrel might be gathered up. The character of this asphaltum is much the same as that found along the California coast from Santa Barbara to San Pedro, where oil exists abundantly. As to its existence in large quantity here, we know, as yet, next to nothing—that is, the public know nothing. Some time after the visit to the above district two companies were formed—one the Great Salt Lake & Promontory Oil & Asphaltum Co., the other the Utah Asphaltum & Oil Co. One has sunk a well 1400 feet, the results of which are known only to themselves. They have, however, been securing additional areas beyond those first held by them.

The oil vents on the flats extend far to the south, and from each vent flows water less saline than the brine of the lake. With this water slowly oozes the liquid asphaltum. At no time in the past does there seem to have been a greater flow of asphaltum than now. When the water rose high above its present level there was no evidence of its existence there; and far out into the lake, where the water reaches a depth of 12 to 20 feet, the evidence of the asphaltum being in greater quantity may exist, but at that depth no one has yet made any investigation. Even along the shore the student or prospector who visits the spot, unless he can ferret information from the management of the 1400-foot bore hole, can only know that at one point on the north shore of Great Salt Lake oil and asphaltum exist in at least limited quantity and exposed on the surface over considerable area. The rock formation in the Promontory to the eastward is almost entirely of Cambrian—slates and Silurian limestones containing few fossils. Save where the green sandstone outcrops at a few points along the lake, the lake sediments cover the flat surface of the desert. Fifty miles to the southwest the Southern Pacific Railway Co. have gone down 2700 feet for fresh water, and salt water carrying much sulphuric acid has been encountered.

The gold output of the Rand in South Africa is gradually increasing from month to month, the output for the month of March being officially stated to have been 385,575 ounces. This is at the rate of over \$90,000,000 per annum—a greater output than has ever been reached on that field. With the more extensive opening of the deep levels this output will continue to increase, and will, without doubt, unless something at present unforeseen occurs, pass the hundred million dollar mark. The output of over \$7,700,000 per month for a mining section not over 40 miles in length, and a great portion of that unproductive and undeveloped, is an interesting thing to contemplate from almost any standpoint.

A COMPARISON of working costs in mine operation is only of value when all the conditions at the several mines, of which a comparison is made, are known. These conditions comprise a variety of things, among them the size of the vein or ore deposit; hardness of the rock; method of mining, timbering and filling; cost and efficiency of labor; transportation cost; situation and depth of the mine; amount of water to be handled, and a great many minor things, but all of which add materially to the aggregate cost.



Where the Oil Seeps From the Ground, Great Salt Lake, Utah.



At the Oil Well, Great Salt Lake, Utah.

In 1878 oil wells were in operation in eastern Wyoming, near Jenny's Stockade, the oil being used by the Black Hills mines. Utah is the youngest region wherein capital has given attention to searching for either asphaltum or oil. For about fifteen years the mining of the hydrocarbons has been profitably carried forward, in Carbon, Uinta and Utah counties, gilsonite, elaterite, ozokerite and crude asphaltum being mined at many points within this area—gilsonite particularly, which is a hard, dry and almost chemically pure asphaltum, being abundant in fissures in the red sandstone, near Fort Duchesne, in Uinta county. The chief feature of this sketch, however, is the subject of gas, oil and asphaltum in the Great Salt Lake valley. This valley proper, measuring it from the town of Malad in southern Idaho to the point of the mountains, 20 miles south of Salt Lake City, is about 112 miles from north to south, and in width from east to west about 100 miles. On its western borders several important mountain spurs rise from the broken plain and, on the eastern side of the valley, the rugged, bold and far-extending Wasatch range presents one of the most conspicuous examples

and to-day it has fallen into disuse.

Turning to the more important subject of oil and asphaltum, the existence of either was not thought probable within the above area until recently. Those who carried out the work of the United States Geological Survey within the valley during the '70s and '80s do not touch upon the subject, and it was not until about the year of 1890 that any one thought of investigating.

From the year 1890 to 1900 attempts were made on the east shore of the lake, between Salt Lake City and Farmington, to discover oil, the borings being shallow, and no discoveries were made. Over this same area during the past five years parties from Pittsburg, Pa., have gone to a considerable depth to ascertain if oil exists in that part of the valley. As to the results of these investigations, no one, save the employees, know anything, and such knowledge as they possess will probably be kept secret.

As to the surface indications for oil or asphaltum on the east shores of the Great Salt Lake, none are known unless where, in the clay banks near the



## The Law in Tunnel Site Cases.

In the past it has been the policy of this paper to publish in full the text of important decisions of the United States Supreme Court. The opinion of the highest Federal Court becomes law and is of greater importance and effect than the statutes themselves, for the statutes are never considered good law until the Supreme Court has been called upon to interpret their meaning. The recent opinion of this court in the case of the Creede & Cripple Creek M. & M. Co., petitioner, vs. the Uinta Tunnel M. & T. Co., which opinion was written by Justice Brewer, is one of the most important decisions handed down by the Supreme Court in recent years and places a new construction on an important phase of the mining law. The opinion in full is as follows:

The Creede and Cripple Creek Mining and Milling Company, Petitioner, vs. The Uinta Tunnel Mining and Transportation Company.

On writ of certiorari to the United States Circuit Court of Appeals for the Eighth Circuit.

[January 30, 1905.]

Mr. Justice Brewer delivered the opinion of the Court.

Certiorari to review a judgment of the United States Circuit Court of Appeals for the Eighth Circuit, (119 Fed. Rep. 164), reversing a judgment of the Circuit Court of the United States rendered upon a verdict of a jury directed by the court.

The action was originally brought by the Creede and Cripple Creek Mining and Milling Company as plaintiff against The Uinta Tunnel Mining and Transportation Company as defendant, in the District Court of the county of El Paso, Colorado, for the possession of certain mining claims and for damages. Equitable relief was also prayed. On motion of the defendant the action was removed to the United States Circuit Court for the District of Colorado, where, also on its motion, the pleadings were reformed and the action made one for the possession of the property and damages.

The plaintiff filed an amended complaint, alleging in substance that it was the owner in fee and in possession and entitled to the possession of the Ocean Wave and Little Mary lode mining claims—being survey lot No. 8192, evidenced by mineral certificate No. 338, the patent of the United States to said plaintiff for said claims bearing date December 21, 1893—that said claims were duly located and discovered on the 2d of January, 1892, and that the patent related back and took effect of that date for all purposes given and provided by the laws of the United States and the State of Colorado concerning mining claims.

Entry upon the claims and ouster of plaintiff by defendant by means of its tunnel were also alleged.

Thereafter the defendant filed its answer. Upon motion of plaintiff certain portions thereof were stricken out, and on the trial testimony offered by the defendant in support of the portions stricken out was rejected.

The matter to be determined is the sufficiency of the defenses pleaded and stricken out. To appreciate them fully it is well to state some facts about which there is no dispute, and it is sufficient to state the facts in reference to one of the lode mining claims, as the proceedings in respect to the two were alike. On February 1, 1892, J. B. Winchell and E. W. McNeal filed in the office of the county clerk of El Paso county (the county in which the mining claim was situated) a certificate of location which, not verified by affidavit or other testimony, stated that they had on January 2, 1892, located and claimed, in compliance with the mining acts of Congress, 1500 linear feet on the Ocean Wave lode, and gave the boundaries of the claim. By several mesne conveyances the title of Winchell and McNeal passed to the plaintiff. On August 5, 1893, the plaintiff made an entry of the claim in the proper land office of the United States, and, no proceedings in adverse being instituted, a patent therefor was issued to it on December 21, 1893. There is no reference in the patent to the discovery or the filing of the location certificate. The first appearance of the claim on the records of any office of the United States is the entry in the local land office of August 5, 1893, and the only prior record in any State office is the location certificate, unsworn to, filed February 1, in which the parties filing the certificate stated that they had discovered the lode on January 2, 1892. On February 25, 1892, a location certificate of the defendant's tunnel was filed in the office of the county clerk of El Paso county, which, verified by the oath of one of the locators, stated that on January 13, 1892, they had located the tunnel site by posting in a conspicuous place and at the entrance to the tunnel a notice of their intent to claim and work the tunnel; that they had performed work therein to the value of \$270 in driving said tunnel and \$80 in furnishing and putting in timbers, and that it was their bona fide intent to prosecute the work with diligence and dispatch for the discovery of lodes and for mining purposes. The certificate also contained a full description of the boundaries of the tunnel site as claimed.

In a general way it may be said that the defenses which were stricken out were a priority of right and an estoppel. We quote these paragraphs from the answer:

"It further avers that the patent of the United States issued for said Ocean Wave and Little Mary lodes and lode mining claims was issued subject to the act of Congress in reference to tunnel rights and subject to the laws of the State of Colorado in reference to the right to run tunnels through ground that may be patented, for the purpose of reaching territory that belongs to tunnel owners beyond such patented claims, and subject to the rights which the defendant The Uinta Tunnel Mining and Transportation Company and its grantors had acquired by reason of the location of said Uinta tunnel,

and in and to any and all lodes, veins, and mining claims that it might cut or discover in driving said tunnel, as is guaranteed to the locator of said tunnel under and by virtue of Section 2323 of the Revised Statutes of the United States; that the pretended discovery alleged and pretended to have been made in and upon said pretended Ocean Wave and Little Mary lodes and lode mining claims, and by virtue of which the plaintiff claims the right to patent the same under the laws of the United States, was not made until long after the location of said Uinta tunnel, and at the time said pretended locations were made said locators thereof were advised and knew that said tunnel had been located and had been and was being prosecuted with due diligence and in strict compliance with the terms and conditions of the statutes of the United States and of the State of Colorado, which authorize and provide for the location and prosecution of such tunnels and which define and determine the rights pertaining thereto; and that said pretended Ocean Wave and Little Mary lode mining claims, so far as the same may be now claimed and possessed by said plaintiff, were taken and held subject to the rights of this defendant as owner of said Uinta tunnel, located in accordance with section 2323 of the Revised Statutes of the United States, and also subject to the rights of this defendant to cross said claims and to drive drifts therein and to follow said lode claims as located by this defendant and to reach lode claims so owned by this defendant, as hereinbefore and hereinafter stated.

"It alleges that it and its grantors have expended in and upon said tunnel the sum of more than one hundred and twenty-five thousand dollars (\$125,000), and in addition to said expenditures have also expended upon surface work, in improvements and expenses, the further sum of not less than ten thousand dollars (\$10,000).

"It alleges that its work and the work of its said grantors in and upon said tunnel has been done openly and without concealment; that the same has been at all times prosecuted under the claim of the defendant and its grantors of the right so to do by virtue of the location of said tunnel and tunnel site location, under and by virtue of the laws of the United States, and under the provisions of section 2323 of the Revised Statutes of the United States; and that the expenditures thereof and the developments made thereon have been made in compliance with the terms and provisions of and in reliance upon said statute.

"That the plaintiff, by permitting and allowing this defendant to expend more than the sum of one hundred and thirty-five thousand dollars (\$135,000) as aforesaid in reaching, uncovering and discovering said ore body, has no right to interfere with the defendant in operating its tunnel over, through and along said pretended Ocean Wave and Little Mary lodes and lode mining claims, but that, on the contrary, the plaintiff by its conduct and actions in the premises as hereinabove recited and set forth has permitted and allowed said defendant to expend said sum of one hundred and thirty-five thousand dollars (\$135,000), and has permitted and allowed the defendant so to proceed with said tunnel through and across said pretended Ocean Wave and Little Mary lodes and lode mining claims until the same has ripened into such a license and permission as entitles the defendant to use its said tunnel as it penetrates said pretended Ocean Wave and Little Mary lodes and lode mining claims, and that said license and permission is such that the defendant cannot be disturbed therein."

It was also alleged that the tunnel had been driven some 2200 feet; that it entered the ground of the plaintiff at about 550 feet from its portal, and in running through that ground the tunnel was driven 625 feet, leaving the plaintiff's ground at about 1175 feet from the portal; that after passing it the defendant discovered in the tunnel three or four blind lodes, which it duly located; and it was not until after the discovery and location of these lodes that the plaintiff commenced this action.

Was there error in striking out these defenses? By section 2319, R. S., "all valuable mineral deposits in lands belonging to the United States, both surveyed and unsurveyed, are hereby declared to be free and open to exploration and purchase." Until, therefore, the title to the land passes from the Government the minerals therein are "free and open to exploration and purchase." A lode locator acquires a vested property right by virtue of his location, (*Clippier Mining Co. v. Eli Mining & Land Co.*, 194 U. S. 220,) but what is the extent of that property right? Section 2322 defines it as follows: "The locators \* \* \* shall have the exclusive right of possession and enjoyment of all the surface included within the lines of their locations, and of all veins, lodes and ledges throughout their entire depth, the top or apex of which lies inside of such surface lines extended downward vertically, although such veins, lodes or ledges may so far depart from a perpendicular in their course downward as to extend outside the vertical side lines of such surface locations." The express grant to the locator made by this section includes only the surface and the veins apexing within the boundaries of the location. Until, therefore, by entry and payment to the Government, the equitable title to the ground passes to the locator, he is in no position to question any rights of exploration which are granted by the other provisions of the statute. The fee still remains in the Government. By section 2320 it is provided that "no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." And by section 2324: "The miners of each mining district may make regulations not in conflict with the laws of the United States, or with the laws of the State or Territory in which the district is situated, governing the location, manner of recording, amount of work necessary to hold possession of a mining claim, subject to the following requirements: The location must be distinctly marked on the ground so that its boundaries can be readily traced. All records of mining claims hereafter made shall contain the name or names of the locators, the date of the location, and such a description of the claim or claims located, by reference to some natural object or permanent monument, as will identify the claim." Tunnel rights are granted by section 2323, which reads:

"Where a tunnel is run for the development of a vein or lode, or for the discovery of mines, the owners of such tunnel shall have the right of possession of all veins

or lodes within three thousand feet from the face of such tunnel on the line thereof, not previously known to exist, discovered in such tunnel, to the same extent as if discovered from the surface; and locations on the line of such tunnel of veins or lodes not appearing on the surface, made by other parties after the commencement of the tunnel, and while the same is being prosecuted with reasonable diligence, shall be invalid; but failure to prosecute the work on the tunnel for six months shall be considered as an abandonment of the right to all undiscovered veins on the line of such tunnel."

It does not appear from the answer or testimony that the tunnel had reached the boundaries of the plaintiff's claims prior to the entry or even prior to the patent. For the purpose of this case, therefore, we must assume that, although its line had been marked out—a line extending through the plaintiff's ground—yet in fact no work had been done within such ground prior to the patent.

The propositions upon which the plaintiff relies are that discovery is the initial fact; that the patent when issued relates back to that initial fact and confirms all rights as of that date; that no inquiry is permissible as to the time of that discovery, it being concluded by the issue of the patent; that such time antedated anything done in or for the tunnel; that no adverse proceedings were instituted after it had applied for patent, and that, therefore, its right became vested in the ground, the same right which any other land owner has, and which could not be disturbed by the defendant by means of its tunnel. (*St. Louis Mining Company v. Montana Mining Company*, 194 U. S. 235.)

On the other hand, defendant contends that, as the first record in any office of the Government was the record of the entry on August 5, 1893, the patent issued in an ex parte proceeding is conclusive only that every preceding step, including discovery, had then been taken; that it in fact located its tunnel site prior to any discovery or marking on the ground of plaintiff's claim; that it was not called upon to adverse plaintiff's application for a patent, because no patent is ever issued for a tunnel, and it had not then discovered any veins within its tunnel; that plaintiff, with full knowledge of defendant's tunnel location, permitted the driving of the tunnel through its ground and beyond, at an expenditure of \$135,000, and made no objection until the discovery of the veins beyond its ground, and then for the first time and to prevent defendant from developing such veins brought this action, and that by such acquiescence it was now estopped to question defendant's use of the tunnel.

Obviously the parties divide as to the effect of plaintiff's patent. The Circuit Court held with the plaintiff, the Court of Appeals with the defendant. It may be conceded that a patent is conclusive that the patentee has done all required by law as a condition of the issue; that it relates to the initiation of the patentee's right and cuts off all intervening claims. It may also be conceded that discovery of mineral is the initial fact. But when did the initial fact take place? Are all other parties concluded by the locator's unverified assertion of the date or the acceptance by the Government of his assertion as sufficient with other matters to justify the issue of a patent? Undoubtedly, so far as the question of time is essential to the right, the patent is conclusive, but is it beyond that?

In order to reach a clear understanding of the question it seems necessary to consider the legislation. Three things are provided for, discovery, location and patent. The first is the primary, the initial fact. The others are dependent upon it and are the machinery devised by Congress for securing to the discoverer of mineral the full benefit of his discovery. Chap. 6 of Title 32, R. S., is devoted to the subject of "Mineral Land and Mining Resources." The first section, 2318, reserves mineral lands for sale, except as expressly directed. The next provides that all valuable mineral deposits in Government lands shall be free and open to exploration and purchase and the lands in which they are found to occupation and purchase. In the next it is declared that no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim. The whole scope of the chapter is the acquisition of title from the United States to mines and mineral lands, the discovery of the mineral being, as stated, the initial fact. Without that no rights can be acquired. As said by Lindley, in his work on Mines, 2d ed., vol. 1, sec. 335:

"Discovery in all ages and all countries has been regarded as conferring rights or claims to reward. Gamboa, who represented the general thought of his age on this subject, was of the opinion that the discoverer of mines was even more worthy of reward than the inventor of a useful art. Hence, in the mining laws of all civilized countries the great considerations for granting mines to individuals is discovery. 'Rewards so bestowed,' says Gamboa, 'besides being a proper return for the labor and anxiety of the discoverers, have the further effect of stimulating others to search for veins and mines, on which the general prosperity of the State depends.'"

Location is the act or series of acts by which the right of exclusive possession of mineral veins and the surface of mineral lands is vested in the locator. For this the only requirement made by Congress is the marking on the surface of the boundaries of the claim. By section 2324, however, Congress recognized the validity of any regulations made by the miners of any mining district not in conflict with the laws of the United States or the laws of the State or Territory within which the district is situated. This is held to authorize legislation by the State. Thus in *Belk v. Meagher*, 104 U. S. 279, 284, it was said:

"A location is not made by taking possession alone, but by working on the ground, recording and doing whatever else is required for that purpose by the acts of Congress and the local laws and regulations."

In *Kendall v. San Juan Mining Company*, 144 U. S. 658, 664, is this language:

"Section 2324 of the Revised Statutes makes the manner of locating mining claims and recording them subject to the laws of the State or Territory, and the regulations of each mining district, when they are not in conflict with the laws of the United States."



See also *Erhardt v. Boaro*, 113 U. S. 527, 533, 534, 535; *The Butte City Water Company v. Baker*, 196 U. S.

And many Territories and States (Colorado among the number) have made provisions in respect to the location other than the mere marking on the ground of the boundaries of the claim. So before a location in those States is perfected all the provisions of the State statute as well as of the Federal must be complied with, for location there does not consist in a single act. In *Morrison's Mining Rights*, (11th ed.) p. 37, the author, having primarily reference to the laws of Colorado, says:

"The location of a lode consists in defining its position and boundaries, and in doing such acts as indicate and publish the intention to occupy and hold it under the license of the United States. The formal parts of location include: 1, the location notice at discovery; 2, the discovery shaft; 3, the boundary stakes."

In *Smelting Company v. Kemp*, 104 U. S. 636, 649, Justice Field, referring to the fact that the terms "location" and "mining claim" are often indiscriminately used to denote the same thing, says by way of definition: "A mining claim is a parcel of land containing precious metal in its soil or rock. A location is the act of appropriating such parcel, according to certain established rules."

See also *Northern Pacific R. R. Co. v. Sanders*, 49 Fed. Rep. 129, 135.

The patent is the instrument by which the fee simple title to the mining claim is granted.

Returning now to the matter of location, the Colorado statutes in substance require:

"1. To place at the point of discovery, on the surface, a notice containing the name of the lode, the name of the locator and the date of the discovery.

"2. Within sixty days from the discovery, to sink a discovery shaft ten feet deep showing a well-defined ore vein.

"3. To mark the surface boundaries by six posts, one at each corner and one at the center of each side line, hewed or marked on the side or sides in towards the claim.

"4. The disclosure of the lode in an open cut, cross cut or tunnel suffices instead of a ten-foot shaft.

"5. Within three months from date of discovery he must file a location certificate with county recorder giving a proper description of the claim, and containing also the name of the lode, the name of the locator, the date of the location, the number of feet in length on each side of the center of the discovery shaft and the general course of the lode." (*Morrison's Mining Rights*, 11th ed. p. 59.)

The issue of a patent for a lode claim in Colorado is therefore not only a conclusive adjudication of the fact of the discovery of the mineral vein, but also of compliance with these several provisions of its statutes. The Supreme Court of that State has decided that the order is not essential, providing no intervening rights have accrued. In *Brewster v. Shoemaker*, 28 Col. 176, 180, it said:

"The order of time in which these several acts are performed is not of the essence of the requirements, and it is immaterial that the discovery was made subsequent to the completion of the acts of location, provided only all the necessary acts are done before intervening rights of third parties accrue. All these other steps having been taken before a valid discovery, and a valid discovery then following, it would be a useless and idle ceremony, which the law does not require, for the locators again to locate their claim and refile their location certificate, or file a new one."

And that has been the general doctrine. In 1 *Lindley on Mines* (2d ed.) sec. 330, the author says:

"The order in which the several acts required by law are to be performed is non-essential, in the absence of intervening rights. The marking of the boundaries may precede the discovery, or the discovery may precede the marking; and if both are completed before the rights of others intervene, the earlier act will inure to the benefit of the locator. But if the boundaries are marked before discovery, the location will date from the time discovery is made."

In 1 *Snyder on Mines*, sec. 354, it is said:

"While the general rule is, as stated elsewhere in the foregoing sections, that a location must rest upon a valid discovery, yet a location otherwise good, with a discovery made after location and before the intervention of adverse claims or the creation of adverse rights, will validate the location from the date of discovery, and generally from the first act towards claim and appropriation—this by relation."

In *Morrison's Mining Rights* (11th ed.) p. 32:

"If a location be made before discovery, but is followed by a discovery in the discovery shaft, before any adverse rights intervene, such subsequent discovery cures the original defect and the claim is valid."

In *re James Mitchell*, 2 L. D. 752, it was held by Commissioner McFarland that, "although prior to location no discovery of mineral was made within the ground claimed, upon a subsequent discovery prior to application for patent the location became good and sufficient, in the absence of any adverse rights."

In *Reins v. Raunheim*, 28 L. D. 526, 529, Secretary Hitchcock declared that "it is immaterial whether the discovery occurred before or after the location, if it occurred before the rights of others intervened. *Erwin v. Perego et al.*, 93 Fed. Rep. 608."

Reference is made to the statement of Secretary Smith in *Etling v. Potter*, 17 L. D. 424, 426, as though that announced a different conclusion, that "a location certificate is but one step, the last one, in the location of a mining claim." But a location certificate is simply a certificate required by the local statute or custom that some things have been done, and, of course, it must come after those things have been done.

Again, in the same volume, pp. 545 and 546, *Northern Pacific Railroad Company v. Marshall*, he said:

"In the location of a mineral claim, placer or lode, the first requirement of the law is a discovery. (Secs. 2319 and 2320 Rev. Stat.) All rights inuring to the benefit of the locators are based upon this initial act. (*Erhardt v. Boaro*, 113 U. S. 537; *United States v. Iron Silver Mining Company*, 128 Id. 673; *O'Reilly v. Campbell*, 116 Id. 418.) When, therefore, a legal location has been made

on land returned as agricultural, the slight presumption in favor of the return of the surveyor general is, ipso facto, overcome, and the burden of proofs shifts to the party attacking such mineral entry. By such discovery and location it is demonstrated that the return was erroneous, and it would be trifling with physical facts to put the onus on the locator to present further evidence until it is shown that, as a matter of fact, he had no discovery."

But the question he was considering was simply as to the burden of proof between one claiming land returned as agricultural land and one claiming a portion thereof, as an apparently legal location of a mineral claim.

In *North Noonday Mining Company v. Orient Mining Company*, 1 Fed. Rep. 522, 531, Judge Sawyer, in charging the jury, said:

"I instruct you, further, that if a party should make a location in all other respects regular, and in accordance with the laws, and the rules, regulations and customs in force at the place at the time, upon a supposed vein, before discovering the true vein or lode, and should do sufficient work to hold the claim, and after such location should discover the vein or lode within the limits of the claim located, before any other party had acquired any rights therein, from the date of his discovery his claim would be good to the limits of his claim, and the location valid."

To the same effect was the charge of the same judge in *Jupiter Mining Company v. Bodie Mining Company*, 11 Fed. Rep. 666, 676.

In *Cedar Canyon Mining Company v. Yarwood*, 27 Wash. 271, the Supreme Court of Washington ruled that

"In the absence of intervening rights, the fact that mineral is not discovered on a claim until after the notice of location is posted and the boundary mark is immaterial, and, where the discovery is the result of work subsequently done by the locator, his possessory rights under his location are complete from the date of such discovery." (*Nevada Sierra Oil Co. v. Home Oil Co.* [C. C.] 98 Fed. Rep. 673; *Erwin v. Perego*, 35 C. C. A. 482, 93; Fed. Rep. 608; *Jupiter Min. Co. v. Bodie Consol. Min. Co.* [C. C.] 11 Fed. Rep. 666; 1 *Lindl. Mines*, s. 335, and cases cited.)

See especially *Erwin v. Perego*, cited in this quotation, decided by the Court of Appeals for the Eighth Circuit. Tending in the same direction are *Thompson v. Spray*, 72 Cal. 528, 533; *Gregory v. Pershbaker*, 73 Cal. 109, 118; *Tuolumne Consol. Min. Co. v. Maier*, 134 Cal. 583, 585.

But what is the meaning of the statute? Its language is "no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located." Does that require that a discovery must be made before any marking on the ground, especially when as under the Colorado statutes several other steps in the process of location are prescribed, or does it mean that no location shall be considered as complete until there has been a discovery? Bearing in mind that the principal thought of the chapter is exploration and appropriation of mineral, does it mean anything more than that the fact of discovery shall exist prior to the vesting of that right of exclusive possession which attends a valid location?

This may be looked at in another aspect. Suppose a discovery is not made before the marking on the ground and posting of notice, but is then made, and it and all other statutory provisions are complied with before the entry which is an application for the purchase of the ground, of what benefit would it be to the Government to require the discoverer to repeat the marking on the ground, the posting of notice, and other acts requisite to perfect a location? If everything has been done which under the law ought to be done to entitle the party to purchase the ground, wherein is the Government prejudiced if the precise order of those acts is not followed? Or, to go a step farther, suppose, on an application for a patent, an adverse suit is instituted, and on the trial it appeared that the plaintiff in that suit had made a discovery and taken all the steps necessary for a location in the statutory order, although not until after the applicant for the patent had done everything required by law, would there be any justice in sustaining the adverse suit and awarding the property to the plaintiff therein on the ground that the applicant had not made any discovery until the day after his marking on the ground, and so the discovery did not precede the location?

These suggestions add strength to the concurring opinion of three leading commentators on mining law, the general trend of the rulings of the department and decisions of the courts, to the effect that the order in which the several acts are done is not essential, except so far as one is dependent on another. Doubtless a locator does not acquire the right of exclusive possession unless he has made a valid location, and discovery is essential to its validity, but if all the acts prescribed by law are done, including a discovery, is it not sacrificing substance to form to hold that the order of those acts is essential to the creation of the right? It must be remembered that the discovery and the marking on the ground are not matters of record but in pais, and if disputed in an adverse suit or otherwise must be shown, as other like facts, by parol testimony. It must also be remembered that the certificate of location required by the Colorado statutes need not be verified. The one in this case was not. A locator might, if so disposed, place the date of discovery before it was in fact made, and at any time within three months prior to the filing of the certificate.

But it has been said that the question has been decided by this court adversely to these views, and *Enterprise Mining Company v. Rico-Aspen Mining Company*, 167 U. S. 108; and *Calhoun Mining Company v. Ajax Mining Company*, 182 U. S. 499, are cited. In the former case the question was as to when a vein discovered in a tunnel must be located, and in the opinion (page 112) we said:

"In order to make a location there must be a discovery; at least, that is the general rule laid down in the statute. Section 2320 provides: 'But no location of a mining claim shall be made until the discovery of the vein or lode within the limits of the claim located.' The discovery in the tunnel is like a discovery on the surface. Until one is made there is no right to locate a claim in

respect to the vein, and the time to determine where and how it shall be located arises only upon the discovery—whether such discovery he made on the surface or in the tunnel."

But that comes far short of meeting the question before us. It is undoubtedly true that discovery is the initial fact. The language of the statute makes that plain, and parties may not go on the public domain and acquire the right of possession by the mere performance of the acts prescribed for a location. But the question here is whether, if there be both a discovery and the performance of all the acts necessary to constitute a location, the order in which these things take place is essential to the right of exclusive possession which belongs to a valid location?

In the *Ajax* case the contest was between mining claims on the one hand and a mining claim and tunnel site on the other. All the mining claims had passed to patent. The plaintiff in error, who was defendant below, held the junior patent issued upon a later entry, and the entries of plaintiff's claims were made and the receiver's final receipts issued prior to the location of the tunnel site. In other words, the defendant, admitting that its right to a tunnel had not been established by a location at the time of the entries of plaintiff's claims, sought to invalidate them by proof that there had been no previous discovery of mineral. This was refused by the trial court, and we sustained the ruling, saying (p. 510):

"The patents were proof of the discovery and related back to the date of the locations of the claims. The patents could not be collaterally attacked. This has been decided so often that a citation of cases is unnecessary."

An entry, sustained by a patent, is conclusive evidence that at the time of the entry there had been a valid location and such valid location implies as one of its conditions a discovery, and the decision only went to the extent that this could not be challenged by one who at the time of the entry had made no location and therefore had acquired no tunnel right. There is nothing in this ruling to conflict with the views we have expressed.

It would seem, therefore, from this review of the authorities as well as from the foregoing considerations that, as between the Government and the locator, it is not a vital fact that there was a discovery of mineral before the commencement of any of the steps required to perfect a location, and that if at the time of the entry everything has been done which entitled the party to an entry, to wit, a discovery and a perfected location, the Government would not be justified in rejecting the application on the ground that the customary order of procedure had not been followed. In other words, the Government does not, by accepting the entry and confirming it by a patent, determine as to the order of proceedings prior to the entry, but only that all required by law have been taken.

If, therefore, the entry and patent do not of themselves necessarily determine the order of the prior proceedings, why may not any one who claims rights anterior to the entry and dependent upon that order show as a matter of fact what it was? One not a party to proceedings between the Government and the patentee is concluded by the action of the Government only so far as that action involves a determination. There is a determination by the fact of entry and patent that there was prior to the entry a discovery and a location. Having been so determined, third parties may be concluded thereby.

But it may be said that when the time of a particular fact is concluded by an adjudication or when an opportunity is presented for such an adjudication and not availed of, the time as stated must be considered as settled; that when the plaintiff applied for its patent if there was any question to be made by the defendant of any statement of fact made in the location certificate, or other record, it should have been challenged by an adverse suit. Failing to do so, the fact must be considered to be settled as stated. Undoubtedly, if in an adverse suit the time of any particular matter is litigated, the judgment is conclusive, and if the date of discovery stated in the plaintiff's location certificate had been challenged in an appropriate action brought by the defendant and determined in favor of the plaintiff, there could be now no inquiry. So, when the owner of a lode claim makes application for a patent and the owner of another seeks to challenge the former's priority of right on account of the date of discovery, it is his duty to bring an adverse suit, and if he fails to do so that question will be as to him concluded. Such is the purpose and effect of the adverse proceedings.

Is the same rule also applicable to a tunnel site? This opens up the question of what are the rights and obligations of the owner of a tunnel? And here these facts must be borne in mind. The owner of a tunnel never receives a patent for it. There is no provision in the statute for one, and none is in fact ever issued. No discovery of mineral is essential to create a tunnel right or to maintain possession of it. A tunnel is only a means of exploration. As the surface is free and open to exploration, so is the subsurface. The citizen needs no permit to explore on the surface of Government land for mineral. Neither does he have to get one for exploration beneath the surface for like purpose. Nothing is said in section 2323 as to what must be done to secure a tunnel right. That is left to the miners' customs or the State statutes, and the statutes of Colorado provide for a location and the filing of a certificate of location. When the tunnel right is secured the Federal statute prescribes its extent—a tunnel 3000 feet in length and a right to appropriate the veins discovered in such tunnel to the same extent as if discovered from the surface.

If the tunnel right was vested before a discovery in the plaintiff's lode claim the defendant ought to have the benefit of it. The plaintiff's right does not antedate his discovery, at least it does not prevail over any then existing right. But, it is said, the defendant did not adverse the plaintiff's application for a patent; that its omission so to do precludes it from now asserting a right prior to the date of discovery named in the certificate of location, just as a judgment in an adverse suit involving the question of date would have been conclusive. Is the



owner of a tunnel, who simply seeks to protect his tunnel and has as yet discovered no lode claim, bound to adverse an application for a patent of the lode claim, the lode of which was discovered on the surface? It is contended that the case of *Enterprise Mining Company v. Rico-Aspen Mining Company*, supra, decides this question. But in that case the line of the tunnel did not enter the ground of the lode claim, but ran parallel with and distant from it some 500 feet, and we held that the mere possibility that in the line of the tunnel might be discovered a vein which extended through the ground of the distant lode claim did not necessitate adverse proceedings. Here the line of the tunnel runs directly through the ground of the plaintiff, and the question is distinctly presented whether, in order to protect the right to that tunnel, the defendant was called upon to adverse? Whatever might be the propriety or advantage of such action, the statute does not require it.

Sections 2325 and 2326 provide the manner of obtaining a patent and for adverse proceedings. The first commences: "A patent for any land claimed and located for valuable deposits may be obtained in the following manner." This, obviously, does not refer to easements or other rights, nor the acquisition of title to land generally, but only to land claimed and located for valuable deposits. Then, after prescribing certain proceedings, the statute adds, "if no adverse claim shall have been filed with the register . . . it shall be assumed that the applicant is entitled to a patent . . . and that no adverse claim exists." The next section commences, "where an adverse claim is filed during the period of publication, it shall be upon oath of the person or persons making the same, and shall show the nature, boundaries, and extent of such adverse claims." The section then authorizes the commencement of an action by the adverse claimant and a stay of proceedings in the Land Department pending such action, and adds:

"After such judgment shall have been rendered, the party entitled to the possession of the claim, or any portion thereof, may, without giving further notice, file a certified copy of the judgment roll with the register of the land office, together with the certificate of the surveyor general that the requisite amount of labor has been expended or improvements made thereon, and the description required in other cases, and shall pay to the receiver five dollars per acre for his claim, together with the proper fees, whereupon the whole proceedings and the judgment roll shall be certified by the register to the Commissioner of the General Land Office, and a patent shall issue thereon for the claim, or such portion thereof as the applicant shall appear, from the decision of the court, to rightly possess. If it appears from the decision of the court that several parties are entitled to separate and different portions of the claim, each party must pay for his portion of the claim, with the proper fees, and file the certificate and description by the surveyor general, whereupon the register shall certify the proceedings and judgment roll to the Commissioner of the General Land Office, as in the preceding case, and patents shall issue to the several parties according to their respective rights."

Reading these two sections together it is apparent that they provide for a judicial determination of a controversy between two parties contesting for the possession of "land claimed and located for valuable deposits;" in other words, the decision of a conflict between two mining claims, a decision which will enable the Land Department without further investigation to issue a patent for the land. A tunnel is not a mining claim, although it has sometimes been inaccurately called one. As we have seen, it is only a means of exploration. The owner has a right to run it in the hope of finding a mineral vein. When one is found he is called upon to make a location of the ground containing that vein and thus creates a mining claim, the protection of which may require adverse proceedings. As the claimant of the tunnel, he takes no ground for which he is called upon to pay, and is entitled to no patent. A judgment in adverse proceedings instituted by him (if such proceedings were required) might operate to create a limitation on the estate of the applicant for a patent to the mining claim, and thus, as it were, engraft an exception on his patent. But taking the whole surface the applicant is required to pay the full price of five dollars per acre with no deduction because of the tunnel. The statute provides for no reduction on account of any tunnel. The tunnel owner might be said to have established his right to continue the tunnel through the lode claim after patent, a right which he undoubtedly had before patent, or at least before entry. There is no statutory warrant for placing in a patent to the owner of a lode claim any limitation of his title by a reservation of tunnel rights. In *Deffehack v. Hawke*, 115 U. S. 392, 406, we said:

"The position that the patent to the plaintiff should have contained a reservation excluding from its operation all buildings and improvements not belonging to him, and all rights necessary or proper to the possession and enjoyment of the same, has no support in any legislation of Congress. The land officers, who are merely agents of the law, had no authority to insert in the patent any other terms than those of conveyance with recitals showing a compliance with the law and the conditions which it prescribed."

Other limitations on the full title granted by a patent for a mineral claim are recognized in the statutes. Thus, by section 2339, which is found in the same chapter as the other sections quoted, the one devoted to "Mineral Lands and Mining Resources," it is provided that:

"Whenever, by priority of possession, rights to the use of water for mining, agricultural, manufacturing or other purposes, have vested and accrued, and the same are recognized and acknowledged by the local customs, laws, and the decisions of courts, the possessors and owners of such vested rights shall be maintained and protected in the same; and the right of way for the construction of ditches and canals for the purposes herein specified is acknowledged and confirmed."

But it has never been supposed that the owner of any of these rights was compelled to adverse an application for a patent for a mining claim, for they are not "mining claims."

The decisions on the question of the duty of the tunnel

owner to adverse the application of the lode claimant are not harmonious. In *Bodie Tunnel & Mining Company v. Bechtel Consolidated Mining Company*, 1 L. D. 584, Secretary Kirkwood held that a tunnel location was a mining claim and necessitated adverse proceedings to protect its rights as against an applicant for a lode claim, (see also *Back v. Sierra Nevada Con. Mining Company*, 2 Idaho, 420,) while the Supreme Court of Colorado in *Corning Tunnel Company v. Pell*, 4 Col. 507, denied the right of a tunnel owner to adverse the application for a patent for a lode claim where the lode had not been discovered in the tunnel and the discovery shaft was not on the line of the tunnel. Lindley (sec. 725,) referring to the decision in *Enterprise Mining Company v. Rico-Aspen Mining Company*, supra, said:

"In the light of this decision and the one which it affirms, the rule may be thus formulated: Where a lode claimant applies for a patent to a location embracing a lode which has previously been discovered in the tunnel, the tunnel claimant will be compelled to adverse to protect his rights. A right in the particular lode inures to the tunnel proprietor immediately upon its discovery in the tunnel, which right is essentially adverse to the lode applicant; but where there has been no discovery in the tunnel, and it cannot be demonstrated that the lode will be cut by the tunnel bore, there is no necessity for an adverse claim."

Without further review of the conflicting authorities, it would seem that whatever may be the propriety or advantage of an adverse suit, one cannot be adjudged necessary when Congress has not specifically required it. Until the discovery of a lode or vein within the tunnel, its owner has only a possibility. He is like an explorer on the surface. Adverse proceedings are called for only when one mineral claimant contests the right of another mineral claimant.

If the defendant was not estopped by a failure to institute adverse proceedings, then the trial court erred in striking out the parts of the answer in reference to the date of plaintiff's discovery, and the judgment of the Court of Appeals was right.

This conclusion avoids the necessity of any inquiry as to the effect of the alleged estoppel, and the judgment of the Circuit Court of Appeals is affirmed.

### The Wild Mill.

The Wild mill, illustrated herewith, presents what are claimed by the manufacturers to be a series of improvements. A good way to prevent slimes and increase the capacity of a machine is to have the portion of the product that is of sufficient fineness pass the screens. The illustration shows that the feed of the mill is directly on and through the revolving screen, eliminating that part of the product that is of sufficient fineness to pass the finishing screen from the mill, only that part requiring crushing going to the mill. At each revolution the contents of the mill is thrown to the screen and the oversize returns to the mill—a continuous operation, resulting in the fact the mill only operates on that product needing crushing. The revolving ring die, of steel, runs at 150 revolutions per minute, giving a peripheral speed to ring die of 1500 feet per minute. The mullers are placed loose in the mill and weigh nearly 200 pounds each. They obtain their power and speed from contact with the ring die. They have 216,000 square inches of contact per minute. A 5-stamp battery, of 850-pound stamps, dropping at ninety-six per minute, gives 27,168 square inches per contact. One thousand pounds of Swedish pebbles

is caught by the scoop and discharged into the screen. That of sufficient fineness passes, while the oversize goes to the mill with the feed. The screen, which revolves in the opposite direction of the mill, is double. A 6-mesh screen being placed an inch inside the finishing screen, only lets that portion of the material which is of sufficient fineness to pass it and reach the finishing screen, increasing the capacity of the finishing screen as well as protecting it. The machine has only five bearings, two on the main shaft and two on the counter shaft operating the screen and the feeder and the bearing of the revolving screen. A steel cover incloses the machine, which can be removed by removing two nuts. Catalogue showing the details of above mill, with mill plans of recent erections, will be sent on request by the S. H. Supply Co., Denver, Colorado.

### Water Handling Plant.

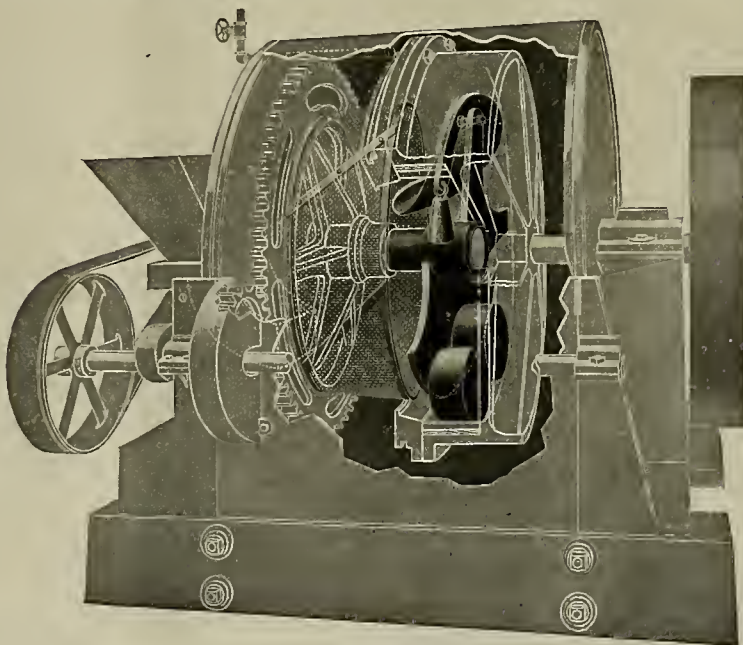
At the Hampton central power station of the Delaware, Lackawanna & Western Railroad, near Scranton, Pa., is a new water hoisting plant which embodies some features which should prove of interest to metal miners. A shaft has been sunk at a central point to a depth of 460 feet, and all the company's mines in the vicinity are arranged to drain to it. The arrangements for handling water at this shaft are thus described by the *Electrical Review*:

"Water will be hoisted from this shaft by means of two buckets suspended from a hoist tower over the shaft. Around the base of the tower has been built a concrete basin, into which the buckets will be dumped. The water will be piped from this basin to the boiler and turbine station, where such of it as is needed for condensing and other purposes will be utilized. The remainder will be carried on down the hill and discharged into the Lackawanna river.

"The hoist tower is 93 feet from the base to the center of the sheave at the top. It is built of structural steel, roughly in the shape of an A. From the tower are suspended two buckets 6 feet in diameter and 19 feet 6 inches deep. The capacity of each bucket is seventeen tons of water. In the bottom of the bucket are located two lift gates with an area practically equal to the cross section of the bucket. These gates are lifted automatically when the bucket reaches the top, and the water is discharged through the bottom into a spout fitted below the bucket, and which deflects it to either side of the shaft. Each bucket makes a complete round trip in one minute and fifty-five seconds, the total lift being 555 feet.

"The buckets are raised and lowered by means of an 800 H. P. induction motor running at a constant speed of 400 revolutions per minute, driving a pair of drums on which the cables from the buckets are wound. These drums are conical in order to obtain a slow starting speed. The diameters of the drum are 16 feet and 10 feet. The motor is set at right angles to the drums, and motion is transmitted to the latter through a friction clutch and bevel gearing. Band brakes are placed at a number of different points, in order to make a quick stop if necessary."

These buckets are of unusually large size and will



The Wild Mill.

fed to the mill were discharged through a 30-mesh screen in forty-eight minutes. This was done with no more vibration to the machine and with seemingly as much ease as ordinary ore. The revolving or centrifugal motion of the ring die holds the ore to the outside and directly in the path of the crushing members without the use of plows or scrapers. As the ore reaches the top of the mill it

handle a great deal of water if run constantly at the usual speed of hoisting engines, as each of these buckets has a capacity of over 4000 gallons when full.

COPPER SULPHATE has been successfully used in a number of instances in purifying the water of reservoirs within the past year or two, one of which was described herein in the issue of September 3, 1904.

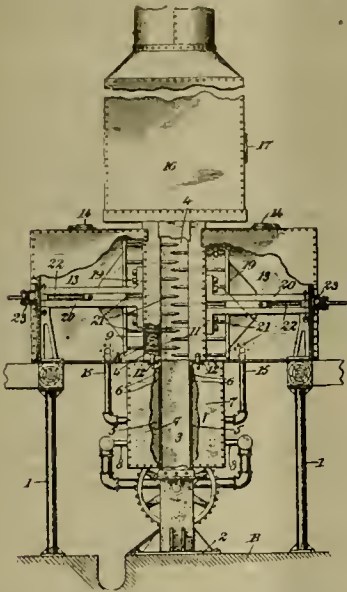


# Mining and Metallurgical Patents.

PATENTS ISSUED MAY 2, 1905.

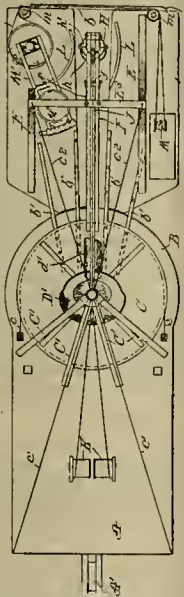
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

APPARATUS FOR THE TREATMENT OF ORES.—No. 788,330; R. G. Reilly, Albuquerque, N. Mex.



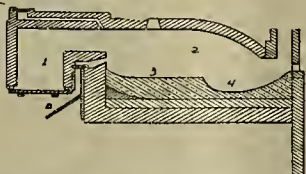
Apparatus for treating ores, vertical smelting chamber comprising lower and upper sections, lower section being provided with lateral apertures above bottom thereof, air chambers adjacent to lower section and communicating with apertures, air chambers adjacent to upper section, means for forcing cold air into upper and lower air chambers, and agitating devices arranged in upper air chambers and having bars arranged to project through apertures in walls of upper section of smelting chamber.

DREDGING MACHINE.—No. 787,953; A. N. Smith, Chicago, Ill.



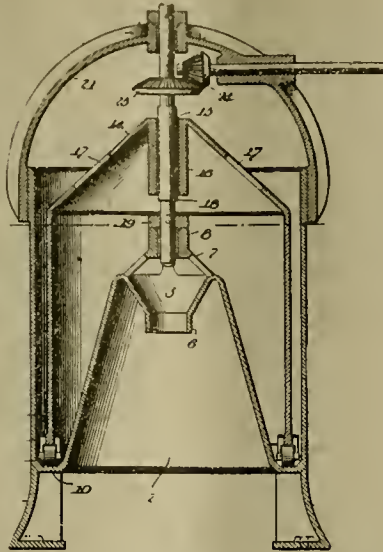
In dredger, combination with scow, of turntable upon forward end thereof, pontoons secured to and adapted to move with turntable, main derrick, crane, one end of which is guyed to derrick, opposite end secured to and moving with turntable, scoop or dipper supported by cable passing over one end of crane and suitable mechanism for operating scoop.

COPPER SMELTING AND SEPARATING.—No. 788,589; G. Mitchell, Los Angeles, Cal.



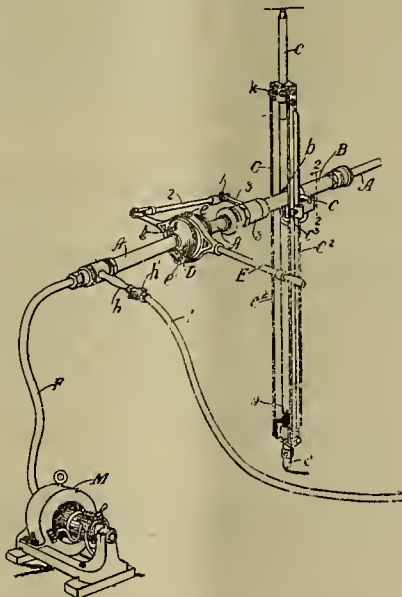
Process of separating siliceous ore, which consists in subjecting raw ore to reducing atmosphere in smelting furnace, fusing it therein, avoiding chemical union of metal with silica in smelting furnace, and withdrawing molten matte.

ORE SEPARATOR.—No. 788,799; C. W. Strong, Ward, Colo.



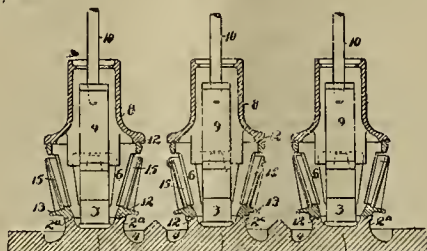
In ore separator, combination of tank having re-entrant conical bottom portion which is open at upper end, spider supported upon open end of re-entrant bottom, bearing carried by spider, rotatable grinding bell open at bottom and surrounding re-entrant bottom of tank, there being annular space between bell and tank constituting feed space to receive material for treatment, grinding rollers carried by bottom of bell and traveling upon bottom of tank, bottom edge of bell being spaced above bottom of tank to permit of passage therebetween of material under treatment, sides of bell and tank being parallel with top of tank seated above top of re-entrant bottom portion, top of bell being conical and rising above top of tank, and upright drive shaft piercing top of bell with its lower end mounted in bearing and terminated short of top of re-entrant bottom portion.

MINING DRILL.—No. 788,593; F. W. Olecott, U. S. Navy.



Combination of rotary drill; bearing in which drill rotates; box carried by drill; clutch mechanism, rotatably mounted in box and adapted to release from drill and to clutch drill and rotate therewith; manual operating means carried by box and operatively connected with bearing for moving box, and means for rotating drill.

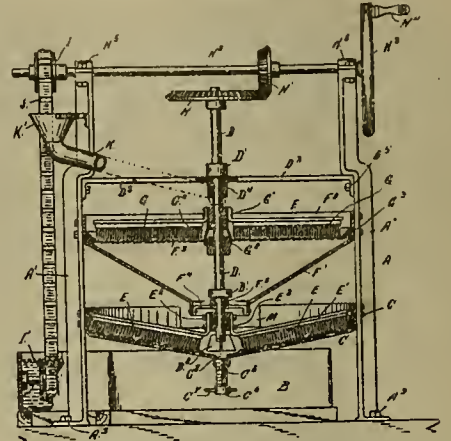
STAMP MILL.—No. 788,729; G. C. Richards, Oakland, Cal.



Stamp mill mortar made in three integral separable sections comprising base with central die recess and surrounding trough, central section in form of hollow inverted truncated cone resting on walls of die recess, central section having screen openings and outwardly extending base flange overhanging.

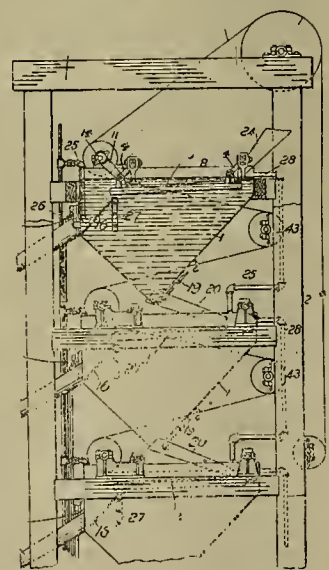
trough, upper section resting on central section and having contracted neck extension and integral hopper which extends into upper portion of central section, sections having interlocking meeting ends whereby they may be assembled and held intact without use of bolts or other securing means.

PLACER MACHINE.—No. 788,737; H. J. Swarts, Denver, Colo.



In placer machine or concentrator, combination with suitable supporting frame, of two stationary pans one mounted above other, lower pan having conical bottom and provided with circular and intersecting radial grooves whereby values or concentrates are directed downwardly to center of pan which is lowermost, upper pan being provided with screen adapted to reject coarser portion of material under treatment, brushes revolubly mounted in operative relation with each pan, brushes of lower pan being inclined to conform with inclination of pan's bottom and adapted to act on material thereon, and brushes of upper pan being arranged above screen and acting on material thereon, and suitable means for rotating two sets of brushes.

MACHINE FOR CLASSIFYING AND SIZING ORES.—No. 788,688; W. E. Wild, Denver, Colo.



In machine for sizing and classifying granulated ores, combination with stationary tank supported within suitable frame, of horizontal swinging screen suspended within and near top of tank by links hanging at all times forward of vertical and having only upward and forward movement in one lateral direction and only downward and backward movement on return, means for swinging screen on links whereby during movements screened material is discharged through mesh down into tank and oversize is discharged over forward end, stationary inclined partition screen crossing tank in path of fall of oversize and secured at side and bottom edges to side and front walls of tank, gated opening in front wall of tank at foot of partition screen for discharge of oversize, and gated opening in bottom of tank for discharge of screened material.

PROCESS OF TREATING FINE ORES.—No. 788,813; D. Baker and W. W. Hearne, Wayne, Pa.

Process of desulphurizing and agglomerating fine iron ores or residues, which consists in eliminating sulphur by means of oxidizing atmosphere at temperature best suited for purpose, and moving mass into temperature which shall cause particles thereof, due to impurities contained therein, to fuse sufficiently to become semi-plastic and sticky, and to agitate mass by revolving it about horizontal or inclined axis.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

Press dispatches state that an ice gorge formed above the town of Fairbanks, the capital of the Tanana section of Alaska, and caused the Tanana river to change its course, leaving the town some distance from the river and the boats at the landing at the time are stated to be lying on the muddy bed of a river which is practically dry. The gold output of the Fairbanks district in 1903 was \$40,000. In 1904 it was about \$400,000, and it is expected that the season of 1905 will see this latter amount largely increased. There are twelve or more creeks in this vicinity which produce payable gravels. These several streams drain a territory of not less than 500 square miles. All of these creeks are within 25 miles of the Tanana river, and a railway now under construction will make Fairbanks one of the most accessible towns in the interior of Alaska. This new and unexpected change in the course of the Tanana river may result in the site of Fairbanks being abandoned for some other location not subject to the caprice of an ice-jammed stream. On page 301 is an illustration of Fairbanks as it appeared the latter part of 1904. The town is not on the main river, but on a slough of the Tanana, navigable for the larger steamers only at high stages of water. There were from 4000 to 5000 people in Fairbanks last summer, and it is said about 3000 remained through the winter. Chena is about 10 miles below Fairbanks on the river. The towns are connected by telephone with the principal producing creeks. In the Tanana district the grades are generally flat and the gravels covered by a thick accumulation of moss, which interferes with prospecting and mine operation. It is thought that mechanical means of handling the gravels will generally give more satisfactory results than hydraulicking, particularly as water is scarce. The gold producing creeks of this region are all small, with rarely over 100 to 200 inches of water. The gravels are from 2 to 80 feet deep, some creeks being deeper than others, and generally frozen throughout the year. The bedrock is usually mica schist—and in some instances this bedrock is payable to a depth of 1 foot to 18 inches. Steam "point" drifting and open pit work are mostly followed in working the ground. In this region ditch construction has thus far been difficult, owing to the heavy deposit of moss and muck. It is thought that the quantity of gold in the gravels, and their extent, seem sufficient to give the camp a permanence like that of the other placer camps in the Yukon-Tanana country. The depth of the deposits has rendered the work of development a slow one. The claims require capital for their development, and the method used most extensively is steam drifting with points. The expense of working the ground consumes probably from one-third to one-half of the output, and the total production from the close of navigation in 1903 to the end of July in 1904 was probably not less than \$350,000. No large quartz veins were observed, and the conditions are apparently unfavorable for quartz mining. The origin of the placer gold is probably to be found in the small quartz stringers which occur generally in the schists.

Manager Hoggatt has started work at the 160-foot level of the Jualin, Berners hay, with sixteen men.

In a recent U. S. Geological Survey report G. C. Martin describes the gold deposits of the Shumagin islands, west of Kodiak and south of the Alaska peninsula. The Apollo Con. mine is near the southern end of Unga island, 3 miles west of the town of Unga. The mine has been yielding since 1891 and claims a production of over \$2,000,000. The ore occurs as a reticulated vein or zone of fracture in a large mass of andesite and dacite, and consists of free gold, pyrite, galena, zinc blende, copper pyrite and native copper. The gangue minerals are quartz and smaller amounts of calcite and orthoclase. The ore body strikes north 43° east, and is, in general, vertical. It is from 5 to 40 feet wide and forms a shoot that pitches northward. The King mine, 1½ mile north of the Apollo, has produced some gold, as has also the Shumagin claims on Baralof or Squaw harbor, 2 miles north. The beach sands near Sand Point, on Popoff island, were washed for gold during the summer of 1904 by from twenty to forty men. All of the gold is found below mid tide and most of it around big stones at the level of low tide. The gold is undoubtedly derived from neighboring mineralized zones in the andesites, which make up the greater part of this and Unga island.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The structural work on the extension of the reduction plant at the Copper Queen smelter at Douglas is going up rapidly. The material is now on the ground and the iron piers and girders are being swung into position. The reduction plant will be as long again as it is now when completed and there will be room for twelve converter stands.—At the Wolverine and Arizona, near Bisbee, the big drift is in 775 feet. The drift from the 300 level is in 200 feet. About thirty men are working at the Wolverine. Water in the shaft is lowering away steadily, due to neighboring pumps. Bisbee, May 9.

#### Gila County.

(Special Correspondence).—D. D. Jayne of Detroit, Mich., acting for the Mascot M. Co., has bought T. D. Morris' claims in the Clark mining district, 28 miles south of Fort Thomas.

Fort Thomas, May 8.

The Payson Milling Co. has been formed by J. W. Boardman, M. McDonald, W. H. Hillgas, R. R. Wilson, J. W. Wentworth and W. C. Colcord, all of Payson, in the Green Valley mining district, to build a quartz mill at Payson.—D. D. Jayne of Detroit, Mich., acting for the Mascot M. Co., has bought from T. D. Morris of

Globe gold claims in the Clark mining district, 28 miles south of Fort Thomas. A mill is to be built on the property.—The Arizona-Colorado Co. at Globe is preparing to resume work and intend sinking their shaft several hundred feet.—It is reported that the Globe-Boston Copper M. Co., which has been idle for some time, will resume operations soon on the Copper Hill.—The Arizona Commercial Copper Co. has put in a Sullivan compressor to run eight drills, and a Vulcan steam hoist.

The April output of the Old Dominion smelter at Globe was 3,082,937 pounds of blister copper, 99.3% fine, obtained from two furnaces running eight days and three furnaces running twenty-two days. With the installation of another furnace, the completion of the concentrator and machinery for moving the ore, Old Dominion will be in a position to increase her production. Three furnaces are still in blast and the average daily output of copper is 100,000 pounds. Preparations are being made for another converter, and the extension of the smelter building and erection of another furnace will follow without delay. The briquetting plant above the smelter is completed, with the exception of laying tracks and providing facilities for handling the briquettes mechanically. At the new shaft the crusher house is finished and construction of the sampling mill is progressing. The new pump of 750 gallons per minute capacity at the twelfth level station is ready to start, and hereafter all pumping will be done through the new shaft. The annual report of the Old Dominion Copper M. & S. Co. for year ending December 31, 1904, shows that the company produced 15,368,147 pounds of fine copper at a total cost of \$1,800,018, from which was realized \$1,941,617. The cost per pound of refined copper at Globe was 14.14 cents, cost per pound of handling 1.05 cent, and the total cost per pound of fine copper, deducting silver and gold values, was 11.19 cents. Smelting cost per ton of ore was \$4.04, and per ton of charge proper \$3.09. The cost of mining per ton was \$4.55, to which must be added pumping, \$1.30, and development, \$0.95, giving a total of \$6.80.

#### Mohave County.

W. A. Walker, superintendent of the Cerbat Mountain M. Co., near Cerbat, reports that the drifts from the bottom of the Vanderhilt shaft shows a continuous body of good grade milling ore. The North Star G. M. & M. Co. has been formed by C. G. Edwards, G. C. Edwards and W. J. Schmitz to work mines near White Hills, with principal office at Albert Lea, Minnesota.—Superintendent C. D. Pickering of the Yucca Cyanide M. & M. Co. at Cedar intends to put in machine drills at the mine and a new plant at the mill.

O. F. Posey of Los Angeles, Cal., manager of the Gold Road M. & Ex. Co. at Acme, will put in a 16-drill compressor to facilitate deeper development. The shaft is down 575 feet. At the fifth level a triplex electric station pump is handling twelve gallons per minute, all that the mine is making. Occasional stulls form all the timbering required. Crushing is done at the shaft and the ore conveyed by mule trains 1200 feet to the 140-ton mill, equipped with six Huntington mills, coarse and fine rolls, plates, sizers and a cyanide plant. A filter press and other improvements are to be added. D. Bosqui is mill superintendent.

#### Pima County.

The Lincoln Con. M. Co. is hauling ore to Tucson. The main tunnel is in 150 feet and the Garcia shaft has been cleaned out.

#### Yavapai County.

(Special Correspondence).—The mill at the Greenwood property, near Prescott, has been started, having been idle on account of the bad weather. E. Greenwood is president and general manager of the property, and has drifted over 1200 feet. The main shaft is down 500 feet and is being carried deeper.—Near the mouth of Yeager canyon, 12 miles southwest of Jerome, the Yeager Canyon C. Co.'s main shaft is down 800 feet and a 600-foot drift has been run on the ledge. Concentrates are being shipped regularly from the 60-ton plant. A new hoisting plant has been put in with a capacity of 1500 feet.

Prescott, May 10.

C. H. McKinley of Kingfisher, Oklahoma, is putting in a large placer mining machine on Lynx creek, near Prescott.—The Oriental M. Co. is unwatering the Postmaster at Providence.—E. E. Greenwood has the new mill in operation upon the properties of the Mount Union Con. M. Co., on Mount Union, Hassayampa district, south of Prescott.—Ed. Campbell has started the mill upon the Geo. Zika properties at Richenhar.—It is stated that Kansas City parties have bonded the Rosalie claims, in Turkey Creek district, and propose to place a smelter on the group.—L. Jackson is working the California and Illinois mines, back of Thumb Butte, near Prescott.—J. A. Conlee has fifteen men developing the Bonnie group, near Prescott. The main shaft is down 170 feet.—It is reported that the Crown King mines will resume work on the tailings pit at Crown King.

The Congress Mines Co.'s cyanide plant at Congress is treating 135 tons of ore daily, the ore coming mainly from No. 5 shaft and from the 1975-foot east and west levels. The shaft from that point to the 2050-foot level is said to be in good grade milling ore. A level is being run at the 2059-foot point. M. Goodloe is the general superintendent. S. Gunn is the mine foreman.—A deposit of nitrate of potash is reported from near Briggs.

Manager G. B. Upton of the Oro Grande, near Wickenburg, is keeping the 10-stamp mill running steadily.—It is reported that Manager S. L. White of the White Gold M. Co. on the Hassayampa, near Wickenburg, will put in a 20-stamp mill when the road is completed to the mine.—The Black Rock M. Co. is completing a 60-ton crushing mill and cyanide plant near Wickenburg. F. H. Perkins is manager.

### CALIFORNIA.

#### Amador County.

The Bunker Hill mill, near Amador, was started up May 1 and it is expected that it will be kept in steady operation from now on.—At the Volcano mine, on the Mokelumne river, in Defender district, operated by cap-

italists of Santa Cruz, a 10-stamp mill is being built. The property is being opened up by a tunnel.—The Orchard placer claim, in Pine Grove, is being put in condition for active operations.—W. F. Detert reports that he has finished unwatering his shaft at his copper mine, near Forest Home, and the workmen are clearing out the drifts. The shaft is 440 feet deep.

#### Calaveras County.

The Chispa Placer M. Co. of Murphys have commenced work on a ditch to carry water from San Domingo creek to work mines of Macaroni Flat.—Superintendent West is taking good ore from the Hercules on Indian creek, near Murphys. E. S. Brown of Los Angeles is experimenting with a new mill on the property.—Work has been resumed at the Big Horn mine, near Murphys.

#### Mono County.

A. E. Vandercook, manager and superintendent of the Southern Belle mine, 5 miles northeast of Laws, will sink the New Year shaft to water level, 200 feet below the present deepest workings. The mill will be enlarged by the addition of at least 5 more stamps. A small electric generator will be put in to furnish power for a hoist at the New Year shaft, and for an air compressor. The vein of gold bearing quartz and limonite runs east and west in a magnesian slate and dips at angle of 35° N. The gold deposits of Mono county are found in a number of districts, the most important of which are Bodie, Jordan and Homer districts. Usually most of the gold ores carry some silver. At Bodie they occur in hornblende andesite and in the Homer district in granite. Most of the work in the gold mines of this county is confined to Bodie and the region about Lundy. There are other sections where valuable properties are idle.

#### Nevada County.

All the buildings, excepting the boarding house and powder magazine at the Star mine, 4 miles from Gaston, have been destroyed by fire. The Star property is being operated by the Gaston Co. The loss will amount to \$3000.

The Erie, Dublin Bay, McCarthy and Holland-Oliver mines, near Graniteville, have been bonned by L. D. Sovereign from the owner, George Meinhart of Nevada City. Work on the Erie, which will first be developed, will commence before July.—The pumps have been started at the Charonnat mine at Canada Hill. The new drain tunnel will be completed in a short time and it will be clear of water, after which development work will begin.—The Talbot mine in Willow valley, owned by George Welch, is to be opened up.

#### Placer County.

The Glenn Con. and Blue Eyes, near Last Chance, are being reopened.

#### Sacramento County.

H. E. Pickett has started a dredger near Fair Oaks bridge.

#### Shasta County.

It is reported that forty out of eighty men have been laid off at the Midas mine at Harrison Gulch. The 10-stamp mill and the cyanide plant are still in full operation.

Manager A. C. Halter of the Original Quartz Hill Gold M. Co., working the Original Quartz Hill mines in the Buckeye district, has returned to the mines and reports that the property will be worked regardless of the action of the smelter people.

#### Siskiyou County.

A. C. Brokaw, superintendent Golden Eagle mine on Indian creek, near Fort Jones, is putting in electric power to develop the property.—It is reported that a shaft is to be sunk from tunnel No. 2 of the McKee mine to develop the property at a lower depth.—The Medina M. Co. are putting in a new concentrator at their mill at Oro Fino. They are also handling ore from the Gardner, Carson and Cradle mines.—Cole & Arnold are putting up a stamp mill to treat ore from the Baker ledge on Indian creek.—The shaft of the New York mine on Indian creek is being sunk 200 feet from the 700-foot level by Superintendent J. B. Scott.—Considerable placer mining and dredging are being done in the county.

#### Sutter County.

R. I. Thomas has bonded 6000 acres of land in the Sutter basin for dredge mining. Preliminary prospecting has been under way for some time past.—H. C. Woodrow has bonded 1100 acres belonging to S. Harris, and has arranged with Moore & Day to prospect the property.

#### Tuolumne County.

A new 4-drill air compressor has been put in at the App mine, at Quartz.—An 18-inch ledge of gold-bearing rock is reported in the shaft at Hidden Treasure, near Soulsbyville.—W. H. Barron is working the Parole, near Soulsbyville, deepening the shaft and prospecting.—On the river near Confidence, H. Gould is building a 5-stamp mill on his mine.

R. B. Lucas is building a 10-ton cyanide plant near the Arbona mill, near Tuttle town, to treat sulphurets from the Arbona and other mines.

### COLORADO.

(Special Correspondence).—The postal authorities, it is understood, have ordered an investigation into the methods employed by certain "get rich quick" mining companies doing business in Denver.—E. L. White, commissioner of mines, is preparing to ship the mining exhibit to Portland for the fair. The exhibit will be along the same lines as that sent to St. Louis. While the appropriation by the State is small, being only \$15,000, yet Mr. White thinks the Colorado exhibit will compare favorably with other States. The \$15,000 is for agriculture as well as mining. The mining department has the advantage of having the material available that was used at St. Louis, so that a fairly good display can be made. The educational department also has the material brought from St. Louis, which will be used at Portland.—When the suits brought by miners against the Mine Owners' Association, in which damages to the



amount of over \$1,000,000 were asked, because of the deportations at Cripple Creek, came up for trial at Castle Rock, in Douglas county, last week, neither the plaintiffs nor their attorney appeared. It is not known what will be done with the cases.

Denver, May 9.

#### Boulder County.

The Wolfstongue M. & M. Co.'s mill at Nederland has been temporarily shut down because of a break in the flume.

#### Clear Creek County.

Trevillion and Cutting, lessees of the Pioneer mine, on Silver mountain, near Empire, have made an arrangement with the Empire Tunnel Co. to operate through the workings of the Gold Dirt property, for the intersection of the Pioneer lode on its dip into the Gold Dirt lode.—At the annual meeting of the stockholders of the Sun and Moon M. & M. Co., Manager R. C. Bonney reported that in 1904 the company had done 3263 feet of development work as follows: Upraises, 1330 feet; drifting, 1700 feet; sinking, 233 feet. During the year there was marketed 21,777 tons of ore and concentrates, for which the company received from the local sampling works \$148,280.88. The mine expenses for the year were \$50,635, while \$50,000 was expended for hauling and milling charges. Manager Bonney was instructed to lease all of the upper workings in the Garden shaft under the tribute system, there being exposed at the present time a full year's ore reserve.—In the Newhouse tunnel, the lateral being driven east to reach the William Penn ore shoot will be pushed. From the surface plant, where an electrically driven air compressor is located, the company has a pipe line of 3000 feet to the Newhouse tunnel level, and is now placing 1300 feet of pipe to the breast of their east drift. This will enable the use of their own power, which at present is being supplied temporarily by the Nowhouse tunnel power plant.

B. and H. Shaver, in their lease on the Dictator mine on Columbia mountain, near Lawson, have struck good ore, a gray copper that assays high in silver.—The Jo Reynolds mine is running full capacity and a night shift has been put to work. The ore is run from the mine to the mill over a gravity tram. It is the intention to change this system to electricity and use an electric motor to handle the cars. E. B. Morton of Idaho Springs is manager.—The Sterling M. & T. Co. is shipping good ore from the Beaver claim on Chicago creek, above Idaho Springs. J. J. Hoban is manager.

The Terrible shaft, near Silver Plume, has been unwatered and repaired as far as the eleventh level.

#### Custer County.

The Toledo at Silver Cliff has been driving for the chimney of ore from the 250-foot level. It is now in 350 feet. G. Raymond is superintendent.—The Custer M. & R. Co. will commence development on the First Colorado and the Livingstone, sinking the shaft on the First Colorado.

#### Dolores County.

Rico is becoming the center of zinc production in Dolores county. The United Rico Mines Co. is shipping large quantities of zinc ore from the new Atlantic Cable shaft, of which H. K. Canning is general superintendent.—The 100-ton Enterprise mill at Rico is to be run by the Durango Leasing Co.—The Buckhorn—twelve claims adjoining the United Rico's property on the south and the Union Carbonate mine on the north—has been bonded and leased by Chicago, Ill., capitalists, who will run a tunnel to connect with the shaft workings, through which the property will be operated. The resumption of work, backed by capital and an open market for the zinc and other ores of Rico, marks the opening of a new era for the Dolores country. Fifteen years ago the mines of Newman and neighboring hills were among the most productive in the State. After the panic of 1893 there was a gradual decline, which ultimately suspended work on a great number of properties. The geological conditions were not as well understood as they are now. The rapidly falling price of silver disheartened those whose ores carried little gold. Certain of the larger veins developed such quantities of zinc, for which there was no market, the operators could not proceed; therefore, one after another shut down.

#### Gilpin County.

The Kirk mine in Leavenworth gulch, south of Central City, was twenty-five years ago, according to the Denver Post, a producer of high-grade pitchblende. The operators who worked it under a lease, after having sunk the shaft 125 feet and shipped quantities of this ore, being carried away by the Leadville excitement then prevailing, ceased work. The Kirk was idle from that time until the spring of 1904, when the demand for uranium for scientific uses induced L. G. Nesmith of San Jose, Cal., to secure a bond and lease on the property. He unwatered the shaft, cleared out the debris and broken timbers, made complete repairs and put in machinery, employing as foreman W. J. Thompson. The shaft was deepened 50 feet and drifting to the east has disclosed a vein of pitchblende 10 inches wide. He shipped three tons last month and has in Denver four tons of high-grade ore. In process of mining he has extracted and raised 100 tons that will average 4%.

The shaft is to be sunk 50 feet deeper.

The Norway-Colorado M. Co. are developing their claims in northern Boulder park district under the direction of J. Iverson.—It is reported that work is to be resumed on the Good Springs tunnel on the south side of Boulder park.

#### Gunnison County.

The Augusta Metal M. Co. has men working on the Augusta, above Crested Butte, in the Elk mountains. The tunnel to the ore bodies from the Pittsburgh side of Augusta mountain has been completed.—The Taylor Park M. Co., working the Enterprise mine in Tellurium gulch, in the Tin Cup district, is meeting with success.—A big find of ore is reported as having been made on the Baxter group, owned by Baxter, Witzke and others, in Grant gulch, ½ mile south of the Camp Bird.

#### Lake County.

The Gilt Edge property on the south side of Iron hill,

Leadville, has been sold to the S. M. P. M. Co. for \$200,000. J. H. Crawford, Mendota, Ill., president; G. F. Burtch, Leadville, vice-president; H. A. Rupp, Leadville, secretary. There are two shafts on the property, down 600 feet, and it is the intention of the new company to sink both deeper so as to open up the sulphide zone.

The new work at the Yak tunnel at Leadville—that of driving a lateral into Iron hill—is important to owners of property on the trend of the lateral, as it will drain the hill, allowing the sinking of shafts deeper at a nominal cost. The lateral starts 2300 feet from the mouth of the tunnel, cutting through the Silver Cord ground, thence through Colorado No. 2, thence to the Tucson, and finally to the Belgian, a distance of over 2000 feet. The Tucson shaft is being enlarged and will take two months to complete; then the shaft will be sunk 350 feet deeper, making it 950 feet deep. The lateral will have reached the Tucson before the shaft will have gained the necessary depth; the hill will be drained and the Tucson will have no water to lift. The Tucson is the extension of the Moyer, and the diamond drill has proved that the Moyer ore shoot is in this property to as great extent as in the original.

A strike of high-grade telluride ore is reported in the Manhattan M. & P. property in Willis gulch, near Twin Lakes. O. P. DeFord is president and G. W. Herrington is manager.

#### San Juan County.

The Crispin M. Co., under the management of E. Clemmons, will start work on the Crispin group, near Eureka.—W. H. Taggart is working the Octopus claims, in the south fork of Eureka gulch, 10 miles north of Silverton.—J. Klumartin will resume operations on his San Pedro claims, in Whitehead gulch, near Silverton.—The Auburn Con. G. M. Co. on Tower mountain, near Middleton, has made arrangements for an 8-drill compressor, drills and an 80 H. P. boiler. A new boarding house will be built as well as new bunk houses, machine shop, blacksmith shop and ore house. Work on the property at present is being confined to a tunnel, in 200 feet, being driven to cut the Auburn vein.—Work on the Bullion King property in Porphyry hasin has been resumed by Manager A. J. Durand.—A good strike has been made on the Bald Eagle claim of the Eagle-Klondike group on Cement creek, opposite the Yukon tunnel, 3 miles north of Silverton. The property is owned and operated by Carver & Butler.

J. W. Doolin, in charge of the Mammoth tunnel of the Stony Pass M. Co., near Silverton, reports that the tunnel is in 1225 feet.

#### Summit County.

G. C. Wortman, superintendent Burmah M. Co. at Wortman, near Climax, reports that they are fixing up the old mill to save all values in their silver-lead-zinc ores.—Work is to be started on the Sallie Barber under direction of T. Keith of Breckenridge.—The Senator tunnel, near Breckenridge, is in 1100 feet and has cut 3 ledges. M. M. Howe is manager.—The French creek tunnel is in 850 feet under Mt. Baldy. The French creek tunnel under Mt. Baldy, near Breckenridge, is in 850 feet. Manager M. G. Evans intends to drive 2500 feet before working the ledges.

#### Teller County.

G. L. Keener, leasing on blocks 54 to 60 of the Globe hill property of Stratton's Cripple Creek M. & Dev. Co., is putting in an air compressor in the Chicago & Cripple Creek tunnel that will furnish the power for crosscutting his lease at a depth averaging 800 feet.—The Elkton Con. Co. has cut the Walter vein at the 900-foot level.—The Granite shaft on Battle mountain is to be put down to the 1200-foot depth and a 65-foot gallows frame is to be put up.—Talbot and associates has started sinking the Little Zoe shaft on Beacon hill from the 550-foot to the water level.

### IDAHO.

#### Blaine County.

The North Star claims, on the North Fork of Wood river, have been bonded and leased to the Hailey Mining Bureau, which will begin work before July 1. The ore carries considerable zinc.—Superintendent H. J. Allen of the Big Lode Co. near Hailey, has the new tunnel in 140 feet. They hope to strike a continuation of the Minnie Moore vein.

#### Boise County.

Work has been started on construction of a dredger at the junction of Granite and Fall creeks, near Placerville, for Blaine & Nye.

#### Idaho County.

The Crooked River M. & M. Co. have thirty men working in the mine and mill at Oro Grande. They expect to commence milling ore soon.—W. C. Brower has men at work on the Bison property on Rock creek, near Oro Grande.

#### Kootenai County.

At the Farmer Jones, Pine creek camp, near Priest River, G. C. Sutton is driving a 400-foot tunnel to tap the main ledge.—Pugh & Secord are driving a tunnel on the Camp Bird group.

#### Owyhee County.

Manager Orford of the DeLamar Co. is developing the Rooster Comb property, 9 miles north of DeLamar and 3 miles west of Share's Station, on Reynolds creek.—M. H. Jacobs has miners at work on the King mine, in the Rooster Comb district on Sucker creek, which he has bonded from T. W. Jones of Boise.

#### Shoshone County.

H. W. Ingalls, secretary of the Copper King Co. of Mullan, says that a wagon road is to be built from the mine to Burke.—Work has been resumed on the O. K. group in Government gulch, near Gardner, extending the Mabel tunnel.

#### Washington County.

The mill of the Gold Coin M. Co. has been temporarily shut down by the breaking of a casting in the crusher, which cannot be replaced until the roads are opened up. The mill and cyanide plant has a capacity of 100 tons

and is said to have made a saving of 93%. The ore after passing through the crushers is reduced by rolls to 16 mesh and leached for forty-eight hours. The company is taking ore from the Summit vein and the Maid of Erin vein. They have started a drainage tunnel that is expected to facilitate mining. They have been working forty men all winter.—The Iron Springs Con. M. Co. at Iron Springs has been working forty men during the winter.

### MISSOURI.

#### Jasper County.

Jeffries & Co., who have a lease on the Showmaker land southeast of Joplin, have made a rich strike of free ore at a depth of 110 feet.—The Waymire Bros. have opened up a prospect on the Pearl ground on the Henry Weymann lease, near Joplin.—Judge Phillips' decision that mine operators are responsible in case of cave-ins has been affirmed by the Federal Court of Appeals. The case in question was that of S. Duffield Mitchell v. the Big Six Development Co.—The Gertrude M. Co., composed of W. H. Robeson, G. W. Carter and others, have opened up a mine of jack and lead on the Colorado M. Co. lease at Tuckahoe.—G. L. Florristall of Boston will resume operations at the Florristall & O'Donald mine on the Missouri Zinc Fields land, near Webb City.—The Calumet Lead & Zinc Co., operating on the Horton land near Webb City, has opened up a new body of ore.—H. J. Vancill and B. M. Robinson, both of Joplin, have opened up high-grade ore in the 180-foot level on their mine, near Prosperity, and intend to put up a 125-ton mill.—Patton & Dodge have started their new electric mill, near Prosperity.

#### Lawrence County.

The double lift pumps at the Spring River mine at Stott City have been started.—R. Stephens has rebuilt the old Spring River mill at Stott City.—The Three C crusher has been moved to the McFarlane plant at Stott City by Superintendent F. Harper.

#### Newton County.

The Sunny South Co., composed of O. Bishop, J. Carlyton, L. P. Kelley, H. Chester and S. Hudson, are sinking a new shaft west of Granby, and are down 90 feet.

### MONTANA.

#### Deer Lodge County.

Judge W. H. Hunt in the United States Circuit Court has issued an order directed to the Anaconda and Washoe companies to show cause why a preliminary injunction should not issue against the operation of the Washoe smelter at Anaconda. The order was issued upon the application of F. J. Bliss of Emmett, Idaho, who owns land in the Deer Lodge valley, and many other neighboring farmers who allege their property has been deteriorated in value by smoke and fumes from the big smelting plant. The Bliss petition for the order alleges that property to the value of \$2,000,000 has been damaged. The order to show cause is made returnable June 5th in Helena.

#### Jefferson County.

(Special Correspondence).—The La France Copper Co., a Heinze enterprise, is to take over the Lexington mines, on which Heinze has a lease and option, and the smelting plant of the Basin & Bay State M. Co. at Basin. The Lexington mines are old and worked-out silver properties, which lately have shown indications of turning into copper mines at depth.

Basin, May 8.

#### Madison County.

It is reported that the Watseca M. Co., at Rochester, have closed their mill.

#### Missoula County.

The Orlando M. Co. has been formed to work claims in the Mountain Home mining district.

#### Silver Bow County.

(Special Correspondence).—T. F. Cole and other men interested in the new North Butte Copper Co. have been inspecting the Speculator mines, which are about to be turned over to the new corporation. Negotiations are pending for several other properties.—R. Baggeley, manager of the Pittsburg & Montana Copper Co., says the only reason the company's new process smelter is not in operation is because the development of the mines has been delayed by a deluge of water. The workings of the mine are still flooded and the new electric pumps are not working satisfactorily.—W. A. Clark has purchased the half interest of his partners in the Black Rock mine, in the North Butte district, for \$50,000. The mine is at present worked by the Black Rock Co. under a three years' lease.

Butte, May 9.

The new shaft on the Goldsmith mine, north of Walkerville, has been sunk 200 feet; thirty-five men are at work.

### NEVADA.

#### Douglas County.

It is reported that extensive development is to be commenced at the Longfellow mine, 30 miles south of Carson, under the direction of E. Carman.

#### Humboldt County.

It is reported that the Golden Eagle M. Co., which has been operating on a bonded mine in New Central and been working the property, put in a mill, cyaniding plant and other buildings, under the superintendence of M. D. Smith, has shut down.

#### Lincoln County.

B. F. Lewis of the Parallel G. M. Co. will resume sinking in the main shaft, which is down 165 feet, and has ordered a 15 H. P. gasoline engine.—T. O'Connor of Juniper camp, 20 miles south of Searchlight, announces that he will have his new mill in operation within a week. The first ore to be run will be from the Chiquita mine, whose working shaft is down 230 feet.—The Black Hawk M. Co. of El Dorado is working fifteen men. The new hoist is in place on shaft No. 2 of the Buster mine and sinking has begun. The shaft will be carried



6½x9½ feet in size. An assay office has been built and quarters for Superintendent Gresh are going up. Development work is also being done on the Rand and the Black Hawk mines.

#### Lyon County.

The Davidson & Lockwood quartz mill on Missouri Flat, near Yerington, is running. The mill has a capacity of seven tons a day and is running on ore from the Davidson & Lockwood mine. — E. W. Davies, who with G. Barrett has been developing a mining claim on East Walker, near Yerington, reports that the mine will produce ore sufficient to keep a small mill running, and is figuring on building a mill near the mine and putting in a 10 H. P. gasoline engine to operate the mill and hoist.

#### OREGON.

The text of the new law regarding a date label on explosives states that all blasting powder and fuse shipped into Oregon for use, or manufactured in Oregon for use in Oregon, shall have stamped or printed upon the outside of each of such original package, box, case or wrapper the date of manufacture of the contents thereof. Whenever any blasting powder shows a state of disintegration or decomposition sufficiently so that it remains in a soft condition in a temperature of 42° F., or is in a state of crystallization, which is revealed in some portions being in a hard condition and surrounded by other portions in a soft condition, it shall be deemed to be bad and dangerous powder, and its sale and use is hereby prohibited. Whenever any fuse shows by its appearance to have been overheated, or if it is in a hard and brittle condition, which is seen by breaks and cracks in the wrapper around the outside of the fuse, the same shall be declared unfit for use and sale, and its use is hereby forbidden. It shall be unlawful for any person or persons to sell or exchange or to offer or expose for sale or exchange, or to have in possession for use by his or any of their employes, any blasting powder or fuse which has not been stamped or printed upon as required in Section 1 of this Act, or any blasting powder of which the sale and use is prohibited by Section 2 of this Act, or of any fuse declared to be unfit for use as prohibited in Section 3 of this Act. Whoever violates any of the provisions of this Act shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine of not less than \$10 and not more than \$100 for each offense. This law is now operative.

The law regarding amended location notices states: If at any time the locator of any mining claim heretofore or hereafter located, or his assigns, shall apprehend that the original notice of location of said mining claim is defective, erroneous, or that the requirements of the law had not been complied with before the filing of said notice, such locator, or his assigns, may post and file for record in the manner now provided by law, an amended notice of the said location, which shall relate back to the date of the original location; provided that the posting and filing of such amended notice of location shall not interfere with the existing rights of others at the time of posting such amended notice of location.

#### Baker County.

Owing to the storms and bad roads, the Imperial mine at Cable Cove is unable to deliver its ores to the Sumpster smelter. Snow has fallen in Cable Cove, and has drifted in places to a depth of 20 feet. — The Red Chief, adjoining the Imperial group, is ready to start work. — The Alpine at Cable Cove is reported to have shut down temporarily. — The E. & E. shaft at Bourne is free from water and work on the lower levels is now carried on without interruption from that source. Concentrates are being hauled here to the smelter daily from the mine. The mill is kept steadily crushing ore. — The Victor crosscut, adjoining the Tabor Fraction at Bourne, is in 750 feet, and is said to have cut a 3-foot pay shoot.

#### Josephine County.

The Homestake mine, ½ mile west of Woodville, is shut down after a short run with the 5-stamp mill. It is stated that five stamps are to be added and that electric power is to be used.

#### Lane County.

(Special Correspondence). — Manager W. B. Dennis of the Black Butte quicksilver mine, south of Cottage Grove, has completed his new furnace and reports it as successful. — W. H. Winnings of Illinois has been at the Twin Rocks property at Bohemia making plans for summer work with Manager Lewis Hartley.

Cottage Grove, May 9.

#### SOUTH DAKOTA.

##### Lawrence County.

The Consolidated Power & Light Co. has been formed at Deadwood to supply light to Deadwood and Lead and to furnish power to the various mills throughout the Black Hills. — One of the mills now receiving its power from the Consolidated Power & Light Co. is the Gilt-edge Maid. This mill has been overhauled and improvements made in its method of treatment. It is now treating over 100 tons per day. — It is stated that the 120-stamp mill of the Branch Mint Co. will be in operation by September 1 and that in the mines a large force will be employed. The company's ground is located in the Bare Butte district, at Galena. Attached to the stamp mill will be a complete cyanide plant for the re-treatment of the tailings. Mining will be done from the Hoodoo shaft, at which there has been placed five Gates crushers, and the ore will be dumped into the crushers as it is hoisted and from there into storage bins, from which it will be drawn as wanted into cars for transportation to the mill. J. Hardin is general manager. — The Extreme M. Co., 2 miles northeast of Custer City, is putting in a cyanide plant for the re-treatment of the tailings and a power hoist and air compressor, drill and improved machinery. They intend to connect the milling plant and mine with a tramway. — A switch is being built to the milling plant of the Victoria M. Co. on Spearfish river at the mouth of Squaw creek, in the Ragged Top district, for the delivery of heavy machinery, building material and other supplies. W. M. Glass of Omaha has been made managing director. Work on the 240-ton mill has been started. — Superintendent L. L. Allen of the Lucky Strike M. Co., 9 miles southeast

of Lead, says that they intend to build a large stamp mill on Elk creek. At present there is no work doing at the mines, and will not be until the weather settles and the roads dry up. — It is proposed to build a cyanide plant on the Richmond-Sitting Bull property in the Galena district. C. B. Harris, who was superintendent, has gone to New York City to confer with Henry Earle, the owner. When the property was gutted of its rich smelting ores medium grade ores were left standing, and it is this material it is now proposed to run through the cyanide process.

#### UTAH.

##### Salt Lake County.

Manager W. C. Orem of the Utah-Apex at Bingham has put in a new compressor to facilitate work on the 3000-foot tunnel being driven to develop the ore body.

Furnace No. 1 at the Yampa smelter, at Bingham, has been changed to correspond to furnace No. 2, by increasing the number of tuyeres, thus increasing the blast and the smelting capacity. The new waste heat boiler, the first in this State, is in operation, and its work is said to be effecting a saving in fuel. — Superintendent Taylor of the Bingham Central reports the upper tunnel, which is being driven to strike the Red Elephant vein, is in 150 feet. The Jeff Davis tunnel, which is being extended to open up the Bonham vein, is in 500 feet and seams of iron sulphides are coming in. It is figured that the vein is 100 feet away. — At the Bingham-New Haven, Superintendent Gillan is cutting a station 2000 feet from the mouth of the tunnel, where a 30 H. P. hoist will be put in and a winze sunk. — At the New England, Manager Adkinson reports that the Timber vein, which was cut by a crosscut last fall, has widened to 10 feet between walls. The Nast vein, at the face of the workings, 1700 feet from the mouth of the tunnel, is 5 feet between walls. The mill capacity has been doubled by putting in a new crusher, and both jigs will be placed in commission. — At the Phoenix mine, Manager Gebhardt announces that a new tunnel will be started, 300 feet below the present tunnel, and driven 2000 feet to a connection with the ore bodies. A winze will be sunk on the big ore body opened through the present tunnel, to a depth of 300 feet, where it will be connected with the new tunnel. An electric hoist will be put in at this winze. — The new tables and crusher for the remodeled Kempton mill have been put in. A new ore bin is to be built back of the mill.

Superintendent A. O. Jacobson of the Columbus Consolidated mine of Alta says it will take until July for the teamsters to remove the congestion at the bins, both at the mine and mill, with the production kept going ahead as usual. The road has been broken through to the mine.

##### Sevier County.

B. T. Ashby, working the Aldebaran, near Marysval, will put in an air compressor before any more work can be done, as work has been stopped by the bad air. He has been drifting from the bottom of a shaft 100 feet below the tunnel.

##### Tooele County.

T. Marrion, superintendent of the Flying Dutchman at Sheeprock camp, near Eureka, has the shaft down 175 feet on the vein. A roasting furnace is to be put in.

##### Utah County.

H. J. Kruse, superintendent of the Bogg mine in American Fork canyon, has returned to that property. — G. Summerville, manager of the Blue Rock mine, operated by the Pacific G. M. & M. Co., is continuing work commenced last fall.

#### WASHINGTON.

##### Ferry County.

C. H. McNaughton, of the Belcher M. Co., near Republic, says that the Belcher Company had decided on building a narrow gauge railway from the Belcher mine to connect with the railroads and that ore bins would be constructed at convenient railway sidings; that the ore from the mine will be delivered from self-dumping cars to the bins and delivered thence to the broad gauge cars for transportation to the smelters. — Work has been started on the 115-foot level of the Ben Hur mine, near Republic, and a drift is being driven northward on the vein. The working force has been increased to eighteen men. F. H. Anderson of Detroit, Mich., is assaying for the company.

##### Snohomish County.

The Sultan Placer M. Co. has dug 1400 feet of their ditch, leaving 1750 feet yet to be excavated. Flood gates have been put in and the company is awaiting high water to carry out loose rock in the ditch, which will save \$700 worth of labor. If the expected high water does not come, a temporary dam will be thrown across the stream to raise it high enough to throw water into the ditch.

##### Stevens County.

It is reported that tungsten in considerable quantity has been found at Cedar canyon and Deer Trail camp. Superintendent Blevins of the Copper King mine, near Chewelah, has put additional men in the mine, also men repairing the road between Chewelah and the mine, getting the road in shape for the traction outfit.

#### FOREIGN.

##### AUSTRALIA.

(Special Correspondence). — In 1904 there was an increase of silver production in New South Wales, the exports from that State reaching the value of £2,065,540. The two leading silver producing States are New South Wales and Tasmania. The principal supply in the former is obtained from Broken Hill, 925 miles northwest of Sydney, near the South Australian border, the nearest port being Port Pirie, in the latter State, where smelting operations are conducted on a large scale. Broken Hill forms part of the Barrier district, so called from a series of low hills known as the Barrier Range, and including Silverton, Thackaringa and other argentiferous localities. The Barrier silver field extends over 2500 square miles and was discovered in 1883 by a boundary rider named Rasp. At that time hardly anything was known of the country, there being no roads and

little population, but at present Broken Hill has a population of 28,000. The leading mine, the Broken Hill Proprietary, has produced from the commencement of mining operations in 1885 to the middle of 1904 7,134,526 tons of silver and silver-lead ores, from which were obtained 124,552,679 ounces of silver and 663,423 tons of lead, valued in the London market at £26,896,000. In Tasmania the principal silver fields are in the western and north-western districts, the largest output being from the Mount Lyell mine, where the metal is found with copper. Silver is found in various parts of Queensland, mostly associated with other metals, the principal mine being at Texas, in the Stanthorpe district. There are no silver mines in Victoria or Western Australia, but this is more than compensated by their auriferous richness. The metal is, however, occasionally found associated with gold. In 1903 the value of the Victorian silver thus obtained was £2280, that produced in Western Australia being valued at £19,153. Although the Barrier silver field approaches very closely to the South Australian border, it does not cross it, hence the silver production of that State in 1903 reached a value of only £2071. The great difficulty hitherto experienced in the silver mining industry has been the want of some cheap and effectual method of treating refractory ores. Much has been done in this direction at Broken Hill, and practical men entertain an opinion that within the next few years the cost of extracting the silver and dealing with the other metallic contents of the ores will be reduced fully one-half, if not more. The total value of the silver raised in the Commonwealth to the end of 1903 was £40,124,145, as follows: New South Wales £35,283,159, Tasmania £2,872,276, Queensland £923,725, Victoria £864,276, South Australia £140,441, and Western Australia £40,425. There are rich silver deposits in the Northern Territory of South Australia, but up to the present none have been worked to any extent. In one locality extensive silver lodes have been discovered, carrying 100 ounces of silver and a large percentage of lead to the ton. Lodes of silver-bearing ores have also been found near the Mary river running from 50 ounces to 300 ounces per ton. Most of the lode silver comes from galena, which, as a rule, is very rich in the metal.

Sydney, April 17.

#### CANADA.

##### BRITISH COLUMBIA.

###### Boundary District.

The Jewel Gold Mines, Ltd., in Long Lake camp, are being pumped out preliminary to examination by the Le Roi 2 Co., which has an option on them. The properties consist of the Jewel and the Denoro Grande. The development consists of a two-compartment shaft 330 feet on the dip of the ledge. Three levels have been opened up.

For the week ending May 6 ore was sent out from the Boundary mines as follows: Granby mines to Granby smelter, 11,725 tons; Mother Lode to B. C. Copper smelter, 3636; Brooklyn to Montreal & Boston smelter, 2940; Rawhide to Montreal and Boston smelter, 750; Mountain Rose to Montreal & Boston smelter, 188; Dominion Copper Co.'s Brooklyn and Stewindler dumps to Trail smelter, 150; Oro Denoro to Granby smelter, 100; Sulphur King to Granby smelter, 33; Providence to Trail smelter, 20; Last Chance to Montreal & Boston smelter, 55. Total for week, 19,597 tons; total for year, 325,085 tons. The three district smelters treated ore for the week as follows: Granby smelter, 11,647 tons; B. C. Copper smelter, 3770; Montreal & Boston smelter, 3973. Total for week, 19,390 tons; total for year, 330,165 tons.

The long tunnel on the Golconda, Deadwood camp, is in 375 feet. — The Twin claim, Greenwood, has been bonded by R. Smalles and others from R. Wood & Co. — A new slag hauling locomotive is in use at the Granby smelter, making six steam locomotives now in use at mines and smelter. — The tunnel being run on the Gold Bug to crosscut the ledges is in 125 feet. A steam drill is being used and the contract calls for 300 feet of tunneling. — A report from Grand Forks says that at a general meeting of the shareholders of the McKinley Mines, Limited, owning the McKinley and Hanna mineral claims in Franklin camp, a working bond for \$150,000 has been granted M. M. O'Brien, Jr., of New York, as trustee for Boston and New York capitalists.

###### East Kootenay District.

The output of the St. Eugene mine in Fort Steele division for April was 3200 tons, or an average of over 100 tons per day. Six muckers employed at the St. Eugene mine pleaded guilty and were each fined \$2.50 and costs for violating the eight-hour law. The case was tried before L. Thompson, justice of the peace. On the 8th and 9th of March these men were working in the shaft level. There was a rush of work and they were asked to work overtime in order to have the muck cleared away for the shift following. The matter was reported to the mine inspector, who in turn caused the arrest of the men. There is also a heavy fine for a company violating this law, and the case against the St. Eugene company will come up for trial later on.

###### Northwest Kootenay District.

From Poplar it is reported that the Great Northern Co. will put in a stamp mill this summer and go ahead with the work on the Lucky Jack. — The Spyglass Co. on Poplar creek is resuming operations. — The Primrose and Old Gold are restarting development work on a large scale. — The Guinea Gold, on the summit of the range, will be started as soon as the snow clears off. — The Triune Co. has announced the building of a tramway and the subsequent erection of a concentrator for the treatment of its low-grade ore. — More men are being put to work upon the Nettie L. and Silver Cup, 8 miles from Ferguson, and as a further evidence of activity the promoters of the tunnel scheme to crosscut the leads of this portion of the Lardeau district at depth and finishing up preliminary proceedings anterior to active work. — Near Trout lake the Winslow is being opened by B. White.

###### Rossland District.

C. F. Jackson of the Reddin-Jackson Co. of Spokane says that a Spokane syndicate is getting ready to begin operations on the Iron Horse mine on Red mountain. G. S. Waterlow, director of the Le Roi, J. Cronin,



manager of the War Eagle-Center Star, A. J. McMillan, general manager of the Le Roi, and W. H. Aldridge, manager of the Trall smelter, have been at Russland conferring as to the proposed amalgamation of the Center Star, War Eagle, Le Roi and other properties.

The shipments for the week ended May 6 were as follows: Le Roi, 2350 tons; Center Star, 1767; War Eagle, 1230; Le Roi No. 2, 290; Le Roi No. 2 (milled), 600; White Bear (milled), 300; Jumbo, 300; Spitzee, 90. Total for the week, 6627 tons; and for the year, 121,714 tons.

Slocan District.

It is reported that as soon as the present leases on the Whitewater mine run out, S. S. Fowler will operate the property in the interest of the company.—The Ruth is expected to resume after a shut down of many months. Men are loading and shipping the zinc concentrates at the mill to the Kaslo sampler.—The upper workings of the Queen-Dominion, formerly the Queen Bess, have been leased to L. Savage, Wm. Fogg and M. McGuigan.—J. W. Powel and E. Erickson have purchased the entire holdings of other parties who were interested in the Silver Glimmer mine at Bear lake, and intend to work the property on a partnership basis.

Quebec.

J. Ohalski, Inspector of Mines of the Province, reports the mineral production of Quebec for the year 1904 as follows: The production of metals included twenty ounces gold obtained from prospecting operations in various streams. No systematic operations were carried on in the Beauce district during the year. The output of pig iron was 11,121 tons, made in the charcoal furnaces at Radnor and Drummondville. In making this iron there were used 24,857 tons of iron ore, 3003 tons limestone and 1,446,607 bushels charcoal. Of the ore used, 16,132 tons were hog ore from Radnor and neighborhood, 200 tons hematite from Bolton township, Quebec, 8705 tons from Ontario. The production of minerals for 1904 is reported as follows:

	Quantity.	Value.
Hog iron ore, tons	16,152	\$51,884
Titaniferous iron ore, tons	100	300
Chrome ore, tons	6,429	71,499
Copper ore, tons	23,729	95,000
Asbestos, tons	35,479	1,186,755
Asbestos, tons	13,149	13,149
Mica, pounds	301,565	\$5,924
Other calcined, tons	1,500	18,825
Graphite, tons	25	2,300
Phosphate, tons	730	4,590
Total		\$1,582,341
	Quantity.	Value.
Slate, square	5,277	\$23,247
Flagstone, square yards	3,000	2,550
Granite		120,000
Cement, barrels	23,450	50,450
Lime, bushels	1,000,000	140,000
Brick, No.	130,000,000	625,000
Building stone		530,000
Total value		\$1,491,047

The total value of all products, including the gold, but not including pig iron, was \$3,023,568. The value of the pig iron was \$256,376, which would bring the total up to \$3,279,944. The number of men employed was 5067; their average wages amounted to \$1,359,520. There were four men killed and four seriously injured during the year. This shows 0.79 killed per 1000, the total casualties being 1.58 per 1000 employees. Experiments continue to be made with the black magnetic sands of the north shore of the St. Lawrence, but no commercial work has been done. The titanic iron ore reported was from Kenogami. No work was done on the manganese ore deposits of the Magdalen islands. Assays of this ore gave from 50% up to 64.6% manganese. The other came from St. Malo, near Trois Rivières, where two companies are at work. Chrome-ore mining was active during the year, two companies being at work. The copper mining industry was also active. The Eustis M. Co. is putting in a large electric plant, operated by water power from the Conticooke river. This will enable the company to extend its operations. Asbestos mining is being extended in the Thetford and Black Lake districts. The American Asbestos Co. was organized and is building a large mill. Several companies are operating in mica. The shipments in detail were as follows: 1x1-inch sheets, 3200 pounds; 1x2-inch, 46,680 pounds; 1x3-inch, 100,855 pounds; 2x3-inch, 88,550 pounds; 2x4-inch, 36,450 pounds; 3x5-inch, 14,350 pounds; 4x6-inch, 8050 pounds; 5x8-inch, 3400 pounds; total, 301,565 pounds. The business has been injured by the use of various insulating compounds in which scrap mica is utilized. Only one graphite company was at work. There was no mining of harytes or gypsum. One company made cement and another built works, which were started in January of this year. The Canadian Gas & Oil Co. is boring for gas in the Beauséjour range and has a good outfit. There are small wells in the Province yielding natural gas at several places, among others at Yamachiche, Louisville, St. Barnabe, Ste. Genevieve de Bastian. Some has also recently been discovered at St. Pierre les Bequets. At these places slight borings have been effected by hand through the clay and the gas issuing from the gravel beds is used for heating and lighting houses. Experiments in preparing peat are being made at Farnham, but there has been no commercial production.

MEXICO.

The Chihuahua Enterprise says the new Mexican gold coins of \$10 and \$5 will be as follows: On the obverse the national coat of arms, the inscription, "Estados Unidos Mexicanos," and ornamental scroll work. On the reverse, the bust of Hidalgo, with inscriptions showing the denomination of the coin and the year it was struck. The silver dollar will remain the same as at present on the reverse, but on the obverse it will display the inscription: "Estados Unidos Mexicanos." The silver 50, 25 and 10-cent pieces will have the same obverse as the gold coins. The reverse will display the denomination in large figures followed by the word "Centavos" (cents), and will have a Phrygian cap with rays and a wealth of laurel and oak. Along the milling of the 50-cent piece the words "Independencia y Libertad" will be hollowed out. The milling of the 20 and 10 cent pieces will be straited only. The nickel coins will have an obverse practically the same as the gold coins. The reverse will have an Arabic "Five," the word centavos,

the date of coinage, all enclosed in a grecque imitating the Aztec calendar. The bronze coins: Obverse like gold coins; reverse, the figure indicating the value of the coin, forming with letter C (centavos) a monogram, all surrounded by a laurel wreath. All the coins will have on the reverse the initial of the mint at which they were coined.

Jalisco.

The Amparo M. Co. of Ezatlan intend to build a 100-ton reduction plant as soon as experiments on the ores are completed. F. Sustersio is manager at the mines.—Two railroads that would open up mineral districts in Jalisco and extend from Guadalajara to the Pacific coast are projected. A. W. Geist, formerly of Denver, proposes to interest Colorado and New York capital in the construction of a road from Las Penas, on Banderas bay, as the Pacific terminus. F. M. Ames, an engineer who has charge of some of the Denver & Rio Grande construction work, has made a reconnaissance and is preparing an estimate of the cost of building the line. The other railroad is being promoted by M. C. Miller of Minneapolis, Minn., and the company to undertake its construction has been incorporated under the laws of South Dakota with a capital of \$12,000,000 gold. This road is planned to run via Cocula and Autlan to the port of Chamela. The mountains around Autlan contain some of the greatest copper deposits in Mexico, but the ore is principally low grade.—J. F. Burns and others of the Portland G. M. Co. of Cripple Creek, Colo., are working the Lupita mine, in the Navidad district. The Lupita is a silver-gold property, developed by tunnel on the vein, and the present production is 225 tons daily. The mine is equipped with a steam hoist. The majority of the ore is high grade and the greater part of it is shipped to the smelters. The expense of shipping, smelter charges, etc., amount to \$65 (Mexican) per ton. The lower grade ore is treated in the company's mill on the Mascota river. A cyanide plant, to treat the tailings after concentration, is to be put in.—B. H. Hammett intends to begin work on placer ground in the Pihuamo district.—D. P. Richardson of St. Louis, Mo., and J. Dee of Cocoma, Jalisco, have organized the Cocoma M. & S. Co., to operate the Blake mines, 65 miles west of Ameca.—R. C. P. Smith and associates of Los Angeles, Cal., have bought the Refugio mine, between Ezatlan and Anahuac, from W. M. Mathews, and have commenced development work.

Coahuila.

The Constancia M. Co., composed of Saltillo people, is shipping 4000 tons of ore from its properties in Sierra Mojada. It is operating two of its ten mines and has several properties leased to other concerns. W. Hagemann is general manager.

Tepic.

The Zapopan G. M. Co. proposes to build a cyanide plant at its mines in La Yesca. C. C. Bruckner is manager.

Chihuahua.

A discovery of hismith by T. J. Driscoll is reported from near Ojo Caliente.—C. C. Chase, manager of the Greene Gold-Silver Co., says that W. C. Greene has bought the Santa Brigida mine and mill from Greer & Lanchan and that work would be started thereon. The mine is a silver-gold property which has been worked considerably, but the former owners had put in a mill poorly adapted to the treatment of the ores, and had not the means to go on with the operations. The mine is on the Greene lands in the Sierra Madres, near the Cerro Boluda mine.—B. Gilpin of Cripple Creek, Colo., has taken a lease and bond on the Prieto mine at Parral. He intends pumping the water out and sinking the shaft deeper.

Zacatecas.

The Mesquite Gold Mines, Ltd., at Mesquite del Oro intend to enlarge their cyanide plant. Maurice Cockerell is manager at the mines.—It is reported that B. C. Wheeler is building a cyanide plant to treat ores from the La Novia mine, in northern Zacatecas.

Personal.

H. C. RENO is superintendent Trinity M. Co., Magdalena, Ariz.

F. J. BOOTH is superintendent Kings M. Co., near Cholame, Cal.

H. T. MCALISTER is superintendent Mary Verna mine at Frisco, Colo.

W. K. FRAZER, of Deadwood, S. D., is examining mines in Mexico.

T. F. HOPKINS is manager Golden Eagle M. Co., Grants Pass, Oregon.

W. A. THOMPSON is superintendent Gold Cliff mine, near Weatherly, Or.

G. F. COLTON is manager Duplex mine, Searchlight, Lincoln county, Nev.

C. S. NEWSOM is superintendent Washington-Joliet mine, Breckenridge, Colo.

S. JAMES is superintendent smelter of Las Aztecas M. & S. Co. at Arcos, Mexico.

J. D. SPARGO has resigned as superintendent Gold Road M. & E. Co., Acme, Ariz.

A. Z. CONRAD, secretary Columbus Con. M. Co., of Deadwood, S. D., is in London.

M. M. HOWE is manager Senator mine on North Star mountain, near Breckenridge, Colo.

A. B. MYNOTT has charge of the cyanide plant at the San Alhino mine, El Jicarra, Nicaragua.

F. H. LESCHEN, of Los Angeles, Cal., has opened an assay office at Silver City, New Mexico.

A. A. HEAD of Denver, Colo., has charge of the new mill at Silver Cliff, Custer county, Colo.

J. G. ALLYN, of Chicago, Ill., has been examining properties at Cienegardo Olivas, Mexico.

G. H. CARNAHAN is manager Cia Metalurgica Mexicana, operating Veta Rica mines at Sierra Mojada, Coahuila, Mexico.

C. H. MCMAHON has resigned as superintendent Moeztuma Lead Co., Chihuahua, Mexico, and will give his time to private practice.

C. E. WILBUR, manager Standard Nitrate Co., is at the company's nitre properties in the Chimehucuis valley, 30 miles south of Needles, Cal.

H. T. MCALISTER is superintendent Mary Verna mine at Frisco and of the North American Mines Co. at Uruva, Summit county, Colorado.

S. E. BRETHERTON has returned to Val Verde, Ariz., where he was sent by Prescott parties to examine and report on copper mining properties.

W. B. ROUNTREE, formerly chief chemist for the Mountain Copper Co., is now smelter superintendent for the company at their Keswick plant.

J. F. MORRIS is in charge of a prospecting expedition on the Erythraean border of the Sudan, and expects to return to London towards the end of May.

W. S. KEYES, E. M., has returned to San Francisco, Cal., from his mines near Panuco, Sinaloa, Mex. He expects to return to Mexico in a few weeks.

REFUS BUCK, C. E., left San Francisco, Cal., on the 10th inst., for Dawson, Yukon Territory, where he will put in a water system for the Klondike mining district.

G. W. MYERS has returned to San Francisco, Cal., from an Eastern trip and goes to Alaska at the end of May, thence to the Oeur d'Alenes and eastern Oregon, thence to Australia and New Zealand.

C. M. EYE, who has been with the Nevada Con. Copper Co. of San Francisco, Cal., for some weeks past, sails May 12th for Manila to erect and operate a cyanide plant near that port. This is believed to be the pioneer installation in this line of milling to be made in the islands. The plant is being sent out to M. A. Clarke of Manila by the Joshua Hendy Machine Works.

Commercial Paragraphs.

THE Western Iron Works, of 908-926 North Main street, Los Angeles, Cal., have changed their name to the Western Gas Engine Co.

THE large plant of the Springfield Boiler & Mfg. Co., Springfield, Ill., was entirely destroyed by fire, May 1st. The loss is covered by insurance and the company will no doubt immediately rebuild.

THE Vulcan Iron Works Co. of Toledo, O., have shipped three more "Little Giant" shovels to South Africa. The Vulcan Co. has shipped a number of this type of shovel into the diamond fields in the Kimberly district.

THE Stanley Electric Manufacturing Co. and the General Incandescent Arc Light Co. have consolidated as the Stanley-G. I. Electric Manufacturing Co., with W. M. Crane as president, C. C. Chesney 1st vice-president, M. D. Barr 2nd vice-president and M. J. Insull 3rd vice-president.

W. G. SCHRON, who has been in the employ of the Westinghouse Machine Co. as salesman, recently entered the service of the Allis-Chalmers Co. of Milwaukee, Wis. He will make his headquarters at their Pittsburgh office and devote his attention to the sale of gas engines, steam engines and steam turbines.

THE Abner Doble Co. of San Francisco, Cal., announces that arrangements have been made with the John McDougall Caledonian Iron Works Co., Ltd., of Montreal, Canada, whereby the latter become sole licensees for the manufacture of the Doble system of water wheels in the Dominion of Canada.

A PARTY of prominent engineers and contractors, identified with tunneling enterprises, visited the Glendon, Pa., quarries of the Ingersoll-Sergeant Drill Co. recently and saw a new method of tunnel driving with channelers, of interest on account of its availability for tunneling under the foundations of buildings, no heavy blasting being required.

THE S. H. Supply Co., Denver, Colo., report sales of the Wild mill as follows: Two No. 2 mills to Osson P. Brown, Mexico; one No. 2 mill to Idaho, one No. 1 mill to the Copperopolis Copper Co., Baker City, Oregon, and one No. 1 mill to Arizona. This mill has just been placed on the market after having undergone several months practical tests and has met with a large sale.

THE Westinghouse Electric & Manufacturing Co., through their Denver, Colo., branch, have sold complete electrical equipment for Lander, Wyo., composed of two 75 K. W. engine-type units, alternating current, 2200 volts, 60-cycle, 3-phase; complete electrical installment for Cody, Wyo., consisting of 150 K. W. 60-cycle, 3-phase, 2200-volt alternating current generator, belted to water wheel; also, complete lighting meter and transformer system.

A. P. HEAD, the London, Eng., representative of the Wellman-Seaver-Morgan Co., has completed a tour around the world and has established the following sub-agencies for the Wellman-Seaver-Morgan Co.: At Melbourne, Australian Metal Co., as Australasian agents. The branches of this concern are as follows: New Zealand—Gilbert Machinery Co., Wellington. Queensland—J. Stothert, Brisbane. N. Queensland—J. Coker, Mackay. New South Wales—W. R. Laidley, Sydney. South Australia—J. C. Fraser, Adelaide. West Australia—A. E. Thomas, Coolgardie. Tasmania—L. Tullock, Launceston. In India the following agents, representing



the Presidencies of Bombay, Bengal and Madras, have been appointed: J. Harper, Calcutta; F. Harrison, Bombay; W. H. Oakes, Madras.

## Books Received.

"A Preliminary Report on the Protozoa of the Fresh Waters of Connecticut," by H. W. Conn, is issued by the State Geological and Natural History Survey of Connecticut. The work is very complete on flagellata and infusoria, but less complete on the rarer groups of rhizopoda, heliozoa and suctorina. The figures accompanying the report will be valuable for students.

Under the subject of water supply and irrigation the United States Geological Survey has issued Paper No. 115 on "River Surveys and Profiles Made During 1903," arranged by W. C. Hall and J. C. Hoyt; Paper No. 116, "Water Problem of Santa Barbara, California," by J. B. Lippincott; Paper No. 120, "Bibliographic Review and Index of Papers Relating to Underground Waters, Published by the United States Geological Survey, 1879-1904," by M. L. Fuller, and Paper No. 122, "Relation of the Law to Underground Waters," by D. W. Johnson.

The United States Geological Survey has been conducting a series of investigations in Alaska that have already done much to make the country known and promise to aid future development. Bulletin 250, by G. C. Martin, describes "The Petroleum Fields of the Pacific Coast of Alaska, With an Account of the Bering River Coal Deposits." The Controller Bay petroleum fields are near the mouth of Copper river, and the Cape Yaktag fields are 75 miles farther east. The Cook Inlet fields are 320 miles west of Controller bay, in the middle part of the western shore of Cook inlet, and the Cold Bay field is 160 miles to the southwest, on the southern coast of the Alaska peninsula. The Bering River coal fields are from 20 to 40 miles from the coast, in the valley of Bering river, which flows into Controller bay. The author discusses the geography, geology and economic materials of each field, and also gives analyses of different Alaska petroleum. Bulletin 259 is a "Report on Progress of Investigations of Mineral Resources of Alaska in 1904," by A. H. Brooks and others, and includes "An Account of Placer Mining in Alaska in 1904," by A. H. Brooks; "Methods and Costs of Gravel and Placer Mining in Alaska," by C. W. Purington; "Economic Developments in Southeastern Alaska," by F. E. & C. W. Wright; "Treadwell Ore Deposits, Douglas Island," by A. C. Spencer; "Cape Yaktag Placers," by G. C. Martin; "Gold Placers of Turnagain Arm, Cook Inlet," by F. H. Moffit; "Gold Deposits of Shumagin Island," by G. C. Martin; "Gold Mining on Unalaska Island," by A. J. Collier; "Rampart Placer Region," by L. M. Prindle and F. M. Hess; "Development of Alaska Tin Deposits," by A. J. Collier; "Coal Resources of Southwestern Alaska," by R. W. Stone, and "Coal Fields of Cape Lisburne Region," by A. J. Collier.

Within the past few years a large number of books have been written detailing methods of chemical analysis. A few are now recognized as standard, and the first question suggested by the appearance of a "Manual of Chemical Analysis" by Eugene Prost, translated from the German by J. C. Smith, is why this latest treatise should take a place among those already in the analyst's library. The answer is found in its conciseness and in its authoritativeness. It presents a selection of methods for analyzing the chief mineral products which the metallurgical chemist is likely to meet in his practice. Its worth is due to the discrimination with which the selection has been made, for the author describes only such processes as have proven satisfactory in a large number of cases. This saves much confusion and possibility of error on the part of the chemist. The subject has been clarified, as it were, by filtration through the tests of experience. The subject range includes fuels, waters, ores, metals, alloys and salts, both native and manufactured, and is preceded by excellent directions for preparing the material for analysis. The treatment exhibits a lucid brevity, facilitating rapid use. For example, in the chapter on copper compounds the author divides them into two groups. The first includes native copper and its oxides, and the second ores containing sulphur, the latter being of far greater importance, industrially. Then follow typical tables of composition of each of the ores. This is an important part of the treatment of each subject, and is of the greatest value to the analyst in directing his course of operations. The object of the analysis is clearly stated and the details of manipulation are presented fully, yet tersely. One is inclined to criticize the limited variety of tests, but is reconciled by the excellence of those presented and by the fact that to do complete justice to each element would require an encyclopedia. The space devoted to manganese is rather brief, magnesium compounds are slighted, but on the whole the book is very good and will prove a valuable addition to the practical man's working library. It is published by D. Van Nostrand & Co., 23 Murray street, New York City, for \$4.50, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Trade Treatises.

"Clutchology," of the Automatic Clutch Co. of Akron, Ohio, describes a clutch for power transmission that grips automatically with the load and cannot slip.

The Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York City, issue an interesting pamphlet, form 346, describing "The Central Air Plant," as exemplified in the compressed air power system of the Cleveland Stone Co., North Amherst, Ohio.

## Latest Market Reports.

SAN FRANCISCO, May 12, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 57½c, refined (1000 fine); San Francisco, 57½c; Mexican dollars, 46c, San Francisco; 44½c, New York.

COPPER.—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15@15.25; Electrolytic, 1 to 3 casks, \$15.25; Casting, 1 to 3 casks, \$14.75. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £65 18s 9d spot per ton.

Copper continues quiet with no material change in price. All reports indicate a good demand with steady production. That the pending lawsuits against the several smelters of the West will have a noticeable influence on the copper output or the market is doubtful.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 16s 3d long ton.

SPELT.—New York, \$5.65; St. Louis, \$5.70; London, £23 10s per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.90@30.10; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 35@37½c. London, £136 12s 6d.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$33.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 31½c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

ZINC.—Metallic, chemically pure, 3½c; 50c; dust, 3½c, 10c; sulphate, 3½c, 10c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c. ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs.: 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$23.00@27.00; open hearth billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 3½c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl. CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILES.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

### LUMBER.—(Retail)

Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00@shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2\*, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@2¾c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c per lb.; nitric acid, carboys, 80% B.

OILS.—Linseed, boiled, bbl., 60c; cs., 65c; raw, bbl., 58c; cs., 63c; Lucol oil, boiled, hhl., 51c; cs., 56c; raw-bbl., 49c; cs., 54c. Kerosene—Pearl, per gal., 19c; As; tral, 19c; Star, 19c; Extra Star, 22c; Ecocene, 21c. Elaine, 25c; Water White, in bulk, 12½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 25½c; Deodorized Stove Gasoline, bulk, 16c,

do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, 2.75 per lb.

CHROMIUM.—90% and over, 3½c per lb., 80c.

PHOSPHORUS.—American, 3½c per lb., 70c.

SODIUM.—Metal, 50c.

BISMUTH.—Subnitrate, 3½c per lb., \$2.10.

URANIUM.—Oxide, 3½c per lb., \$3.50.

MERCURY.—Bichloride, 3½c per lb., 77c.

TUNGSTEN.—Best, 3½c per lb., \$1.25.

SILVER.—Chloride, 3½c per lb., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, 3½c per lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Black oxide, 3½c per lb., 2¼@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, 1 ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 2, 1905.

788,620.—REAMER—J. C. Adkins, Stockton, Cal.  
788,626.—SWITCH—C. A. Bisher, Seattle, Wash.  
788,512.—SULPHUR BURNER—H. Blumhardt Jr., Daggett, Cal.  
788,998.—PENCIL—A. E. Buckingham, Oakland, Cal.  
788,703.—CIGARETTE PAPER HOLDER—Minnie P. Casterline, San Francisco.  
788,886.—ILLUSION—W. J. Citron, San Francisco.  
789,005.—SAW GUIDE—Conkey & Bradley, Chloride, Ariz.  
788,890.—WATER HEATER—P. A. Deasy, Oakland, Cal.  
788,718.—POINT COUNTER—C. Z. Ellis, Berkeley, Cal.  
788,528.—SAW HANDLE—J. Fri, Goshute, Or.  
788,582.—HEATER—Fairchild & Pierson, San Francisco.  
788,766.—BORING MACHINE—F. W. French, San Francisco.  
788,641.—CONTROLLER—B. H. Green, Los Angeles, Cal.  
788,907.—SAWMILL—E. Hoops, Tacoma, Wash.  
788,908.—GUN SIGHT—F. D. Hopkins, San Francisco.  
788,720.—OIL BURNER—Johnson & Noyes, Los Angeles, Cal.  
788,926.—FIBER GRINDER—H. B. Jones, Healdsburg, Wash.  
788,649.—DRAPEY CLAMP—Mary E. Kniveton, Phoenix, Ariz.  
789,038.—MANIFOLD BOOK—A. Levison, San Francisco.  
789,018.—STOCK GUARD—H. A. Middaugh, Seattle, Wash.  
788,580.—SMELTER—G. Mitchell, Los Angeles, Cal.  
788,939.—STUFFING BOX—H. L. Noxon, Bakersfield, Cal.  
788,546.—SLACK ADJUSTER—J. R. Reed, Tacoma, Wash.  
788,674.—BUCKET CLIP—B. C. Rihlet, Spokane, Wash.  
788,729.—STAMP MILL—G. C. Richards, Oakland, Cal.  
788,731.—SLAT HOLDER—G. Schwinn, Huron, Cal.  
788,678.—DOUGH RAISER—J. G. Simpson, Los Angeles, Cal.  
788,856.—CLOTHING TABLE—C. J. Stafford, Bakersfield, Cal.  
789,075.—ENVELOPE FASTENER—M. Terletzky, Goshute, Or.  
788,564.—NAIL SET—T. F. Thompson, Empire, Or.  
788,803.—SANTARY DRAINAGE—F. Walker, Los Angeles, Cal.  
788,804.—EVAPORATOR—J. H. Wallace, San Francisco.  
788,618.—FRUIT GRADER—E. M. Widney, Fernando, Cal.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

DUMPING CAR.—No. 788,066. April 25, 1905. Andrew W. Dahner, Sonora, Cal. This invention relates to an improvement in that class of car which is pivoted and tiltable and is provided with a swinging door through which the contents may be discharged. It consists in a means for mechanically opening, closing and locking device for the doors of dumping cars, said device consisting of a lever fulcrumed to the side of the car so as to provide a long and short arm, a curved link having one end connected with the short arm of the fulcrumed lever, and the other with a point stationary with relation to the car, and a second curved link having one end connected with the hinged swinging door and the other with the long arm of the fulcrumed lever.

CIGARETTE PAPER HOLDER.—No. 788,703. May 2, 1905. Minnie C. Casterline, San Francisco, Cal. This invention relates to an improvement in paper holders, and particularly in containers for cigarette papers. The object is to provide a simple, unique and serviceable holder or box which may be carried in the vest pocket and from which successive papers may be removed singly and easily without disturbing the remaining papers in the box. The device consists of a box, a cover hinged to the box having a slot extending transversely across it adjacent to one end, said slot having a length about equal to the width of the box between inside walls, and the width of the contained sheets, and having a lower straight edge and being enlarged and elongated along the opposite edge in the direction of the length of the cover, and a spring-pressed follower in the box co-operating with the cover adjacent to the straight edge of the slot to hold the paper longitudinally of the cover and in the direction of said straight edge.

POINT COUNTER.—No. 788,713. May 2, 1905. Charles Z. Ellis, Berkeley, Cal. This invention relates to an improved playing card holder and game and point counter. The object is to provide a simple, light, artistic, unique and handy metal holder or case which will take up no more room than the ordinary pasteboard case does in which a pack of cards usually comes, but which will have means for recording and counting points and games and will protect the cards when not in use. The device comprises a holder made in two parts, preferably stamped from sheet metal, each having corresponding side and end projections at substantially right angles to the surface of the plate and said side and end projections including a slotted portion on one plate and a tang portion on the other plate and adapted to enter the slotted portion and interlock therewith, said projections affording a support for the edges of the contained pack, the projections at one end being hinged together to permit the plates being opened into the same plane or folded into substantially parallel planes.

STAMP MILL.—No. 788,729. May 2, 1905. George C. Richards, Oakland, Cal. This invention relates to an improvement in stamp mills, and particularly in mills having mortars of the sectional type. In the usual construction of mortars for stamp mills the mortars are cast in a single piece, which is necessarily heavy, bulky and difficult to transport. On the other hand, where it has been attempted to construct mortars of the sectional type there has been difficulty, first, of getting a sufficiently rigid structure, and second, of securing suitably tight joints, both of these considerations being of the utmost importance in a practical mill. Its object is to provide a practical sectional mortar of simple construction, the sections being cast in one piece, easily handled and which may be assembled into a rigid permanent structure having water-tight joints. It consists of three integral separable sections comprising a base with a die recess and a trough surrounding the recess, a central section having radially disposed screen openings and seating on the base between said die recess and trough, an upper section seating on the central section and having a contracted elongated neck to accommodate the stamp and having an integral hopper which discharges into the upper portion of the central section, said sections having interlocking ends whereby they may be assembled and held intact without the use of bolts or other securing means.



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## Mining in Mexico.

The difficulties attendant upon mining equipment and operation in some parts of Mexico are well illustrated in the accompanying engravings. These views are in the southern part of the State of Sinaloa, at and near the city of Mazatlan, one of the principal ports of entry on the Pacific side in Mexico. The handling of some classes of freight at this port is illustrated in typical manner where the native laborers are seen carrying goods ashore in baskets, from the lighters, wading hip deep in the water. A second view shows the city of Mazatlan, with its white or buff adobe houses and red tile roofs, which, with the luxuriant vegetation of the gardens and the blue, hazy mountains in the distance, forms a restful and picturesque scene characteristic of this tropical land. Another view is thoroughly characteristic of a type of Mexican life, in the string of ox carts passing through Mazatlan on their way to the mines at Rosario, 45 miles distant to the southeast. Near Rosario is the noted group of mines known as El Tajo. In Spanish a tajo is an open pit or depression in the ground caused by mining operations at the surface, or caves resulting from the collapse of underground workings. The fourth picture is a view of the pan mill at the El Tajo mines. Originally the ores at this mine were worked by the patio process, common throughout Mexico for several centuries past, and still in use to a great extent. The patio, however, is giving place to modern methods and American machinery. There is, however, an interesting phase of this branch of metallurgy which may be called intermediate between the old and familiar patio process and the Washoe process, as practiced in American pan mills of modern construction, and this is the introduction of mechanical means in the patio to replace mules and horses in mixing the charge after it is spread in the patio.

## Damages From Coal Culm.

A great deal has been said in recent years of the damages done by the tailings from hydraulic mines, stamp mills and dredgers, which have flooded low farming lands, but the gold miners of the West are not the only ones who meet with complaints of this nature. In Pennsylvania many millions of tons of fine coal has been discharged from the breakers into the Susquehanna river, and this fine dust-like coal has flooded the low lands along that stream, ruining the gardens and small farms adjacent to the river—and the coal companies had to pay thousands of dollars in damages in past years to the owners of the damaged lands. A million dollars' worth of this fine coal has been recovered by dredging. Fleets of boats are in operation on this river dredging for this coal between Wilkesbarre and Harrisburg. The coal companies argue that, as they have been obliged to pay for the damages these coal fines have caused, the

coal rightfully belongs to them, and it is said they intend to contest in the courts for the right to the exclusive privilege to recover the fine coal from the river bed and its banks. In the Western States there is no doubt as to how a contention of this kind would be decided, but the laws of the Eastern States differ in many respects from those of the West.

SOME heroic work was recently accomplished in a burning coal mine at Edwardsville, Ill., when the miners concluded that their only salvation lay in

cutting out the burning coal. This they did, sending the burning fuel to the surface in the mine cars. The mine workings were filled with gas, and the heat was almost unbearable, but the entire village depended for its existence on the operation of this one mine. With them it was a case of self-preservation and they were found equal to the emergency, as they usually are when herculean tasks are to be performed in a mine, whether to save lives of their fellow workers, or the property of their employers when it is in danger.



Mazatlan, Mexico.



Unloading Lighters at Mazatlan, Mexico.



Mill at El Tajo, Rosario, Sinaloa, Mexico.



Freighting from Mazatlan to Rosario, Mexico.



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THE mine owners and operators of Australia are forming an organization for the purpose of giving them a standing in court in the event of later troubles reaching the courts.

SOME of the minerals of value over which the average prospector passes, or sees without giving them attention, are cassiterite (tinstone), magnesite (carbonate of magnesite), gem tourmalines, beryl minerals (spodumene, lepidolite, etc.), chromite from borates (colemanite, etc.), zinc carbonates and oxides, various structural materials and many others. These are passed by either because the prospector does not recognize them or fails to appreciate their value. He is usually in search of some definite mineral—usually gold or copper—and all others are passed by as unworthy of attention. Another reason for this is that the most of these substances require capital to develop and make them available, which is usually not one of the abundant possessions of the prospector, but he knows that if he is fortunate enough to find a rich gold-bearing vein or a copper deposit, either of them will bring him ready money, for both are in demand. As a matter of fact, however, as much net money is often made in mining for some of the other minerals mentioned as for gold or copper. The output of the other minerals in the United States far exceeds that of gold, silver and copper combined, these three metals constituting only about one-fourth of the mineral output of the United States, where the total annual output now exceeds one billion dollars.

## Some Unsolved Problems in Mining.

The science of mining has advanced to such a satisfactory state, as compared with the past, that the mining engineer is sometimes disposed to look upon the result of his labors not only with complacency, but possibly with a feeling that not a great deal more remains to be accomplished in this direction.

Such a contemplation of results, however, is scarcely permissible when there really remains so many unsolved problems. The problem of successfully mining to a depth 50% greater than that already reached is one of the most serious matters which today confronts the mining engineer. He has satisfactorily solved the problems generally incident to mining at and near the surface, but he has not yet gone much, if any, below 5000 feet vertically, and possibly he may not be required to do so, except with diamond drill, and yet it is positively known that veins and beds of ore exist at and below that depth which would be largely profitable if situated within 1000 or 2000 feet of the surface. The problems of very deep mining are largely mechanical, and there is every confidence that we shall yet look upon mining operations successfully carried on at depths of 7000 feet, and probably deeper, with no more concern than we now feel in contemplating similar operations between 3000 and 4000 feet below the surface. The economic features of each situation must determine this.

There is, however, another and a far greater problem, and that is to forecast, even approximately, the size, character and value of a mineral deposit or vein beyond the point of actual exposure. Within the past ten or fifteen years a great deal of attention has been given to the genesis of ore deposits, and extensive volumes have been written on the subject by careful observers. As a result, to the knowledge of ore deposits of every character has been added a large fund of very valuable information, and yet we are now no better able to "see beyond the point of the pick," apparently, than when the subject was, comparatively speaking, in its infancy.

One of the most remarkable contributions to mining geology was that of Baron Von Richthofen, in his famous little monograph on the Comstock lode, written in 1866, and issued by the Sutro Tunnel Company. This eminent scientist possessed the faculty of "seeing into the ground" to as great an extent, at least, as any of his successors, who have had the advantage of the more extensive development of the great lode, as well as the improved facilities for carrying on such investigations. The theories expressed in this valuable treatise of Baron Von Richthofen were borne out by subsequent developments in a remarkable manner, when all else is considered. As a matter of course, faults and dykes, if unknown, cannot be anticipated, and it is not without some repudiation that a conscientious mining geologist will undertake to forecast the future of an ore deposit or vein very far beyond the exposed faces, though those having a less knowledge of the science of geology and the vagaries of ore deposits essay this responsibility with the utmost confidence.

Some very deep mines furnish in their development some startling geological facts, which tend rather to a suspension of judgment than to a confident expression of what further and deeper exploration may bring forth. There are veins which show successively at different depths a varying type of structure, size and mineral contents, which cause the mining geologist to hesitate in giving an opinion as to what may be expected below. It is as unsafe to condemn a mine which has been a good producer as it is to predict that a poor one will become largely profitable if only greater depth be reached.

Still another problem, and one which the mining engineer views with some concern, is the possible relation of topography to ore deposition. There are numerous places where veins outcrop along the surface near a mountain top and these outcrops are found to be more or less continuous along the surface, down the mountain side to the bottom of a neighboring canyon. These deposits or veins are worked to the depth of 100 to 300 feet along the outcrop, and when the individual ore shoots are exhausted little or no effort has been made to search for other deposits, either by sinking or driving farther into the mountain on the strike of the ore deposits. This is particularly noticeable where the ore bodies occur as a

series of lenses in mica schist and where there is no distinctly marked fissure. If the mining engineer believes the lenses do not go down to greater depth than the bottom of the first shoots opened from the surface, he must conceive that they do bear some direct relation to the surface topography which suggests a very recent formation of ore bodies. The natural impulse is contrary to this theory, and yet we have in mind a number of instances where the mine operators are seemingly slow to put it to the test by actual experiment.

Mining geologists are, however, beginning to lean toward the theory that generally ore deposits and veins, and more particularly the latter, may become larger with depth, but that the values are lower and disseminated through a greater rock mass, though there appears to be no direct ratio between values and size of the vein. It cannot be assumed because a vein at 1000 feet depth and 10 feet in width carries \$10 per ton, that at 2000 feet, where it is 40 feet wide, it will contain only one-fourth the value per ton found where it was 10 feet wide. Although exhaustive study has been given the genesis of ore deposits, there still remains much to be learned concerning these phenomena.

## State Geological Surveys.

There are few if any States in the Union in which there are neither mines nor quarries. Every State has undeveloped mineral resources, but in some instances these lie untouched and in many cases unknown. The geological surveys and mining bureaus of the several States have done much to call the attention of the public to the undeveloped resources and, in view of the great good accomplished by research of this character, it should be a sufficient stimulus to perpetuate organizations of this kind and, by liberal appropriations, to extend their scope and usefulness. The untechnical and inexperienced observer may pass daily over a deposit of valuable mineral and, being ignorant of its usefulness and value, gives it little or no attention. The careful and painstaking investigation of the trained staff assistants of institutions of this character has brought to the public notice many valuable deposits of mineral in numerous States, and it is superfluous to say that work of this description has repaid to the States many times over all the expense which has attached to the maintenance of the surveys. The United States Geological Survey has also done a great work in this direction, and the scope of its investigations is being constantly widened. Under the present administration the work is being more vigorously prosecuted than in the earlier years, and the public are given the desired information much more promptly than formerly. In this early publicity lies much of the value of a geological survey. After mines and districts have been worked out, these sections have little other than a historical interest. What the public want to know is something of the future probabilities, as well as the past and present operations, and the conditions under which these operations were carried on and the results obtained.

AN interesting phase of the metallurgy of copper is the alacrity with which the management of large plants will tear out an expensive installation to replace it with one of more modern design and which it is believed will effect a slight reduction in the cost of producing copper. There is competition in the mining and reduction of base metals, and the concern which can produce and market copper, lead, zinc, tin, iron or some other metal or mineral substance at the lowest cost per unit is making the most money. This condition does not extend into the gold mining industry. In that branch there is no competition in the market, for the product finds a ready buyer at a fixed price. The only competition with which gold mining has to contend is the cost of production, and the man who can produce an ounce of gold for the least cost under stated conditions is considered the best manager.

THE new eight-hour labor law is to go into effect in Colorado July 1st. The Colorado Fuel & Iron Co. it is said, intend to comply with the law, as it will not affect them materially. The miners work by the ton or the yard, and it remains with them to do all the work possible within the working hours.



## CONCENTRATES.

It is never safe to turn water into a steam boiler when no water can be seen in the glass gauge.

THERE are now nearly 30,000 Chinese coolies at work in the mines of the Rand, South Africa. They are said to be increasing in efficiency.

THE body of the Bonker Hill & Sullivan mine, in the Coeur d'Alene district, Idaho, is from 40 to 100 feet in width. It is mostly concentrating ore.

THE Broken Hill Proprietary Co. is Broken Hill, N. S. W., now produces from 1200 to 1500 tons of zinc concentrates weekly by means of the salt cake process.

LATENT HEAT is the amount of heat which must be transferred or communicated to a substance in a given state or change to another state without raising its temperature.

SEMENTITE has a very low melting point—240° C.—and softens at 250° C., but it melts at a lower temperature than either of them, the point of fusion being 200° C.

Oil was known to exist in the vicinity of Los Angeles for many years before any wells were sunk there. On the San Joaquin, not far from the city, oil seepages were noticed in the early settlement of the country.

THERE was a stampede in the North Park region, near Hahn's peak, Colo., about twenty years ago, in search of lead carbonate, samples of which had been found by prospectors, but no ledge were discovered.

By a normal solution volume  $\frac{N}{V}$  means a solution which contains in one liter of water the equivalent of one gram of hydrogen. Thus a normal solution of sulphuric acid contains 98.08 grams  $H_2SO_4$  in 1 liter of water.

MALAYSIAN IRON ORES, although used in the manufacture of pig iron, form only a relatively small portion of the iron output of the United States. Sementite and hematite are mostly used for the purpose of making pig iron.

THE United States produces 77% of the world's coal, 39% of its pig iron, 14% of its copper, 15% of its zinc and 71% of its petroleum. In the production of coal, pig iron, copper and petroleum the United States leads the world.

THE Guanaco mine of Colorado will be, when completed, the longest tunnel in America and the longest transportation tunnel in the world. In all it will be a little over 10,000 feet, or nearly 4 miles from one end to the other.

CHALVAL is lifted by hydraulic devices in some instances 100 feet vertical from the bedrock in the pit to the frame on the surface. At Steamboogie, Colo., the lift is nearly the height, and in Camp Ruster, New Zealand, it is 100 feet.

GRAND MICHIGANS—that is those having a width of more than 10 inches at the level of discharge—have a lower capacity than the narrow Elzevir-type, but they have a greater amount of gold inside the mortar than the narrow rapid-discharge type.

CHROMIUM also oxide is value, but chrome is a natural red oxide of iron which occurs with other ores of iron. Its color is from orange red to deep red. It has a vitreous luster, is brittle, with a hardness of 4 to 4.5. It contains iron 44.5% and oxygen 55.5%.

In the process of leaching sulphide ores in a solution, the sulphides are oxidized either by the addition of air to the charge in the form of potassium carbonate or by the addition of pieces of zinc or iron, which unite with the sulphur to form sulphide of iron. The latter is the method most commonly practiced.

ALL BORAX contains more or less water of crystallization. Borax glass used in leaching is the borax which has been heated and the water is driven out. If the crude borax is introduced with the charge in a crucible it is likely to cause the charge to boil over thus destroying the accuracy and value of the assay.

In leaching the precipitates from zinc precipitation boxes, it is customary to carefully wash the precipitate through a sieve of 100 mesh after leaching to remove any particles of metallic zinc. The percentage of material passing and remaining in the screen is carefully calculated and the two parts assayed separately.

COPPER may be precipitated from an alkaline solution, a p. copper sulphate in ammonia, by hydrogen sulphide the copper going down as copper sulphide. Gold may be precipitated from alkaline solution, such as gold in cyanide solution, by means of zinc shavings, placed in dust. The reactions are variable.

THE main gauge in mine tracks underground, where there is a capacity of 100 to 1500 pounds are driven by men. A 12 inches surface gauge upon which leather tape are used in the gauges from 10 to 12 inches and sometimes wider, particularly where some motive power such as steam, air or electric motors are in use.

MINERALOGICAL machines are most difficult of transportation owing to the trouble in getting positive reactions. It was owing to the peculiarly unobtrusive construction of the machines of this nature that it was first named machine after Thomas of Great Britain, who was installing face is written in the names.

OPERATIONALLY men who have to handle in their disposal with which they save the time intended are directly in the interests of the mortars; but this practice is pernicious and should never be attempted, as it practically makes the mortar for further legitimate use, the stamps picking wearing impressions in the bottom of the mortar.

A SOLUTION of lead four-silicate value contains in excess of four-silicate and is said to be a suitable and satisfactory electrolyte for refining lead. It is not volatile and is readily handled. The lead other electrolytes, is said to cause the lead to build up in the form of irregular branches, which, extending outward, make short circuits by contact.

THE steam engineer should frequently examine the gauge cocks of his boiler, is in the event of their becoming clogged by deposit of mud or scale or from any other cause a boiler explosion may result as was recently the case in board a steam ship in British Channel, England. Investigation after the explosion proved that it was due to a defective water gauge.

When a vein is displaced by a fault much valuable time and expense may often be saved by using the lead wire in the opposite side of the fault plane or like that has delineated the vein, and the shortest route to the continuation of the ore body is by either drifting, sinking or sinking as the case may require according to the dip of the vein and dip of the fault plane.

It is the aim of the lead smelter to make slag in which there is a constant and definite ratio between the iron, lime and silica which form its constituents, but in copper smelting there is a comparatively wide range in the proportions of these substances permissible. In copper smelting the principal object is to make a fluid slag which will permit the free settling of the particles of metal.

THE reason why some iron presents unvarying copper deposits is due to the fact that, as the oxidation of the original material is being proceeded, copper sulphate was formed and was leached out by surface waters due to rain, the copper being carried away in solution, and the iron being left behind as oxide, together with silica and whatever earthy minerals occurred to be present.

THE fact that minute particles of gold are soluble in solutions of cyanide of potassium has been known for ages. It is thought that unworked compounds were first recovered from the barrels of certain pits, such as the mine at Mount, Georgia, and some other veins, which are known to contain pyrite and in small amount. Potassium ferri-cyanide was discovered by a French chemist, Macquer in 1791.

As to the present to the method of extracting mercury from its ore has been found which is a commercial success. Recently experiments have been made in crushing sulphur ore in rotary furnaces, but the method is still to some extent in the experimental stage. The greater part of the mercury of commerce is being produced in the old style vertical furnaces of brick, fired from the sides and equipped for the particular class of ore it is required to treat that is, coarse medium or fine.

CARBONIZATION is the result of the fusing of zinc and pure silica, present in the electric furnace, and is at present only done in the United States at Niagara Falls. As an alternative it is claimed that one pound of carbonization is equal to three pounds of energy being burned. Carbonization is a most valuable and is a most important material for furnace linings, etc. Under some recent patents the material is not used for this purpose without binder.

PLANTAIN is known to occur in California in Santa Del Norte, Humboldt, Mendocino, Plumas, Sierra and Trinity counties, in New York, near Plattsburgh, in North Carolina, in Florida and Southwestern counties of Idaho, in the Wood River district in Oregon, in Coos, Curry, Josephine and Lane counties. It usually occurs in the form of flattened grains in the heavy water sands. A plantain-bearing ore occurs in the Bonanza mine, Topping in Grand Rapids, Michigan, in the form of sperryite, a plantain fluorapatite.

THE light degree of temperature is what a man may work in a mine is largely determined by the humidity of the atmosphere. If the air be moisture laden he cannot work at temperatures much over 100° F. but if the air be dry a higher temperature than this is tolerable and can

be tolerated by the miner. There are some in some of the big mines of the desert in California where men have worked when the temperature was 125° F. or more, but these men suffered more from the heat than from the work.

SEVENTH STAGE is they are called, have some into the positions in which they are found usually by the three methods. Either the stones are practically in situ, and the surrounding rock having been removed by natural decay and disintegration, leaving the stone in position, or the stone is brought to the surface by pressure and raised to the top of the hill or the water has fallen from some higher position, and some of the stones being to support it in the new position have disintegrated and disappeared, or the rock has been carried to its present position by ice. In some of these conditions are found, and passing some others, some very old stones were many years.

SPERMITE is a light-gray, somewhat siliceous, crystalline, colorless, odorless and tasteless substance. The composition of the mineral is variable. The ore is well as being in other upper silicates, particularly silicates and oxides, results more or less directly from the alteration of spermatite. Combinations of spermatite with lead, iron, arsenic and other minerals with silicates forming distinct ores in which the upper is usually subordinate to the other metals present, are not necessarily included in the above, as they may have been formed from mineral solutions lower and not as the result of the alteration of ores previously deposited.

MAINTAINING MOVEMENTS are caused by pressure movements of the winding cable to the hook. One of the safest methods of attaching the cable to the hook is by forming the end of the rope around a shackle or proper size and securing the ends by means of two or three substantial machine iron clips. The ends of the wires should be wrapped after a liberal supply of rope "tongue" has been applied in plenty, made to cover the loose ends of the rope wires from injuring the inside of the sheaves using the pulleys or ship. In a rope the end of the rope is not within the reach of the men riding upon it and there is no need for its wrapping. Again, every six months this over and if the cable should be not about 1 foot above the sheave and the end again turned back around the shackle. This is a guard against the danger of breaking of the cable due to deterioration. The nine wires in the rope always run to the lower end and the likelihood of twisting and consequent weakening of the wires at that point is thereby greatly increased.

SEVERAL men, who are strong and well defined in figure, besides the surface in the form of numerous strangers, some of which have material value, but which may be considered as indicators of the possibilities being beneath. This peculiar condition is probably due to the fact that the ore in the hanging wall side of the fissure when the movement in the veins took place. The wedge-shaped segment of hanging rock overlying the plane of fracture being that is easily crushed and destroyed and mineral solutions passing along the vein or zone or fracture and may escape in the numerous cracks and veins extending upward to the surface. The discovery of such a vein of mineralization should be followed by certain proceeding, a start should be made in this case of mineral and should the shaft pass out of the mine sinking vertically a prospect should be run to reach it in greater depth. It is generally the better plan to sink the prospect shaft in no mine in the direction of the dip of the small veins, always bearing in mind that the veins probably have a steeper dip than the plane of the main fissure, and in some instances they dip in the reverse direction—that is, upward the first vein. This was the case in some of the smaller discoveries in the Comstock Lode, where it was at first thought, owing to the surface veins, that the veins dipped west. When the first fault vein was encountered it was found to dip east in about 45°.

WIND PUMP is used in pumping material in two of the main mines in Carbon county, Mont. one in Castle Gate and the other in Sunnyside. Wind power is the motive used in the mines. The wind pump is used for pumping material, and the stone is fired by electricity or light when it is not run of the mine. These two mines are very busy, the first is in an extensive mine, and the use of wind pump is an additional precaution against fire explosion, the fire being shut out after there is a heavy run and the wind pump will not raise fire as was first used for pumping is not in use. The wind pump is made in Florida, California, and sometimes the ordinary wind pump used in the manufacture of paper. It is a very heavy ground material, having about the appearance of yellow iron ore. Before being used it is always wet, so that it can be packed and held like snow. After it is wet it is squeezed by the hands so that it has the consistency of ordinary mud, and in this state it is put in the line in any of the powder and tamped in the other pumping material. At the other mines of Mont., near Castle Gate, where most powder is used, mud is not obtained either from the inside or the outside of the mine, is used for pumping. In addition to the above precaution, the prevention of fire explosion, the mines are all supplied with a pipe system for carrying water through them, and the miners and engines are kept thoroughly wet to prevent the drying of dust, as have run shaft.



## The Metallurgy of Copper at Anaconda, Montana.

Written for the MINING AND SCIENTIFIC PRESS by  
A. P. MALLON.

The winning of copper from its ores dates back to primeval times, comprising, in variety, wet methods, as at Rio Tinto, Spain, and the more recent dry processes, as those employed in various parts of the United States, particularly at Anaconda, Montana.

In the extraction of the metal at the latter smelter there are several connecting processes, each of prime importance to the ultimate success of the plant, and which may be said to commence at the Butte mines and terminate at the refinery of the Washoe smelter.

To present the subject in an extensive treatise would require a volume, but it is only the object of this article to outline the rather complicated treatment of an ore as practiced at a modern copper plant, and consequently the ore will be traced in its various changes from the laying down at the concentrator to the shipping of 99.5% copper from the refinery.

As is well known, the ores of Butte are largely low grade and sulphide in character, which necessitates their working on an extensive scale. This is accomplished by the amalgamation of several of the mines in the district. The handling of the enormous daily tonnage is facilitated by the operation of the company's railroad connecting Butte with Anaconda, the crude ore being stored at the concentrator building. On analysis the ore shows the following composition: Silica 58%, iron oxide 16%, sulphur 17%, copper 4%, 1 to 6 ounces in silver and .01 to .02 ounce in gold.

The iron, although not present as the oxide, is calculated as such owing to the fact that the sulphur, with which it is invariably combined, bears the most important part in the smelting of the ore. The latter, therefore, is determined separately. In order to obtain a product from this ore which can be successfully treated in the blast or reverberatory furnaces, it is first crushed by various sized rolls and passed over a series of jigs (both coarse and fine), or concentrated on Wilfley tables. Three products result from the former treatment, namely, coarse concentrates, fine concentrates, and tailings. In the coarse concentrates the silica is reduced to 30%, the iron oxide increased to 28%, the sulphur increased to 29%, and the copper to 8%. Similarly, the fine concentrates have a composition of silica 26%, iron oxide 31%, sulphur 34%, and copper 8%. The tailings are sluiced away and show 90% silica, 3% iron oxide, 3% sulphur, and .8% copper.

Some of the crushed ore is not jigged, but is passed over the Wilfleys, which produce Wilfley concentrates and Wilfley tailings. These concentrates show an increase in copper over the jig product, which is probably due to the sizing before concentration. They have a composition of silica 42%, iron oxide 22%, sulphur 24%, and copper 10%. The tailings have silica 92% silica, 2% iron oxide, 3% sulphur, and .8% copper. There are three products which may now be handled to advantage in the blast and reverberatory furnaces, viz., coarse concentrates, fine (jig) concentrates, and fine (Wilfley) concentrates. Since oxidized ores are more susceptible to treatment in reverberatory furnaces, the fine concentrates are submitted to calcining in McDougal roasters. After treatment the roasted concentrates show a reduction in sulphur of nearly 20%. Calcined concentrates, calcine barrings, and McDougal flue dust result from the operation of roasting. The calcined concentrates have a composition of silica 30%, iron oxide 42%, sulphur 9%, and copper 10%, showing an increase in iron oxide and reduction of the sulphur, the copper remaining the same.

Calcine barrings are lumps of partially fused concentrates which adhere to the rakes in the roasters, and consist of 8% silica, 60% iron oxide, 6% sulphur, 12% copper, and 5% aluminum oxide. This product is utilized in the blast furnace owing to the large percentage of iron, which makes a fluid slag.

In nearly all smelting operations a great loss occurs by volatilization. In the case of roasting this loss is exemplified by the production of a flue dust which contains 36% silica, 27% iron oxide, 19% sulphur, 10% copper, and 5% free sulphuric acid. This valuable product is made into briquettes in combination with raw concentrates and various other flue dusts, and smelted in the blast furnaces.

In the production of a matte in the reverberatory furnaces the following charge is added: Fine concentrates, calcined concentrates, flue dusts, coal and lime. The matte produced is of a higher grade than that resulting from the blast furnace, being of the following composition: Silica 1%, iron oxide 22%, sulphur 24%, copper 47%, aluminum oxide 3%, arsenic and antimony (combined) 2%. The slag is granulated by running direct from the furnaces into flowing water contained in sluice boxes and carried to the dump. It has an analysis of silica 40%, iron oxide 46%, calcium oxide 12%, and copper .2%.

Blast furnaces do not require a finished product for their successful operation, the essential constituent of the charge being a sulphide ore. Pursuant to the above, the first-class or high-grade ores, containing

from 8% to 15% copper, may be added direct. In addition to the above ore, the charge consists of coke (usually 10% on a 5-ton charge), calcine barrings, briquettes, and lime rock (54% calcium carbonate). There are five blast furnaces, having a capacity of 1000 tons daily, but additions are at present being made to this department which will greatly increase the daily tonnage. Blast furnaces produce matte, slag, and flue dust, just as in reverberatory smelting, their compositions being very similar. Blast matte has an analysis of 1.9% silica, 24% iron oxide, 26% sulphur, 44% copper, 4% aluminum oxide, and 1% arsenic and antimony (combined). The slag consists of silica 41%, iron oxide 28%, calcium oxide 22%, copper .2%, and aluminum oxide 8%. The flue dust has an analysis of 36% silica, 22% iron oxide, 10% sulphur, and coke dust in variable amounts. In these analyses the percentage of aluminum, arsenic and antimony is taken into consideration because these minerals are deleterious both in the converting of the matte and also in the commer-



The New Rowe Mill at the Mouth of the Yak Tunnel, Leadville, Colo.

cial value of the finished product. Aluminum in excess makes the matte difficultly fusible in the converting, and arsenic and antimony in quantities over 3% or 4% will render the copper practically useless, commercially. Hence it is desired, as far as possible, to eliminate, by fluxing suitably, these objectionable minerals from the matte.

The next step in the operation is the converting of the matte into metallic copper. For this purpose a cup-shaped vessel capable of holding the product of each furnace is used. The process consists in blowing air through the matte, eliminating the sulphur by forming oxides of that metal. In order to protect the sides of the converter from corrosion, a lining is used made up of a mixture of clay and low-grade quartz ores. The lining is tamped in place several hours before using. The iron, silica, and alumina are slagged off by uniting with the lining. The slag comes to the surface of the charge and can be poured as soon as formed. It consists of 35% silica, 56% iron oxide, 4% aluminum oxide, 4% calcium oxide, and 1.8% zinc. The metallic copper which collects in the bottom of the converter is poured into receptacles, which are of such a shape as to make a suitable anode for use in the refinery. Blister copper is of a slightly lower grade and is sent to the refining furnace, where it is subsequently made into anodes. These products show by analysis 97% copper, traces of arsenic, antimony, iron, sulphur, aluminum, and 80 ounces silver to the ton.

The concluding step consists of the refining of the converted copper. This is accomplished by means of electrolysis, the copper being used as an anode and a solution of 32 grams of copper and 140 grams of sulphuric acid per litre acting as a conductor or electrolyte. The anode dissolves gradually in the electrolyte and deposits on the cathode, which is a thin strip of copper. The action is allowed to proceed for forty days, in which time the anode is completely dissolved. The cathode or electrolytic copper is the finished product of the smelter and is shipped to Perth Amboy, New Jersey, refiners, where it is made into bars, ingots, etc. This product is 99.5% pure, having .0015% arsenic and antimony combined.

The silver contained in the anodes collects in the bottom of the solution tanks as a black mud, which is sold to refiners of smelter products.

We have seen how the copper is extracted by following each step with an analysis of the product, so that in noting the various changes of the elements a practical idea of this fascinating subject can be obtained, even more so than by a visit to a modern copper smelter, where the operations on such a large scale are apt to confuse a novice.

## The Yak Tunnel.

One of the most important mining enterprises of Leadville, Colo., is the Yak tunnel, the portal of which is in California gulch, on the south side of Iron hill. It passes under Iron hill and beneath Breece hill—a distance of over 11,000 feet—passing under a score of mines and into the consolidation known as the Ibox property. The tunnel drains an important section of the Leadville district and also furnishes a convenient and inexpensive means of transportation of the ores mined along its line, as well as supplies good ventilation to the mine workings. The mines along the line of this tunnel produce exclusively sulphide ore, much of which is low grade and requires concentration. Recently there has been built near the mouth of the Yak tunnel a reduction plant known as the Rowe mill. This mill has been built after special designs and it is expected that some experimental work of great value will be accomplished by

it. W. W. Davis, manager of the Yak Tunnel & Mining Co., is also manager of the mill. The accompanying illustration is that of the Rowe mill.

## Mining in Nicaragua.

Consul Bingham, in his official report for 1903-4, says that the gold exported during the year was valued at \$570,000 and was obtained chiefly in the range of mountains that, continuing from Honduras, passes through Nicaragua from north to south. Of this amount, only \$25,000 comes from the west side of the range and the remainder from the east side.

Gold mining has been carried on for many years on the west side of the Cordillera range of mountains, but it is only within the last twenty years that this industry has to any extent been opened up on the east side. Considerable as is the amount of gold now exported from the last-mentioned district, but comparatively few mines as yet have been opened up and are in working order, and it is certain that the whole of the eastern side of the Cordillera is very rich in minerals, and in the course of years will be greatly developed. At present the industry is very much retarded by the scarcity of labor, of water in the dry season, and, more especially, by the entire absence of roads and means of easy communication. Provisions and heavy pieces of machinery have to be carried for many miles up the rivers in open canoes, liable to be capsized in the many rapids that have to be ascended and to danger from rocks and sunken logs. After ascending the rivers, the packages have in many cases to be carried to the mines on men's backs; but few of the companies have been able to make roads from their mines to the river banks passable for ox carts or even pack mules. At first the extraction of gold in this district was to a certain extent retarded by the rebellious nature of some of the ore; but this of late has been more or less overcome by the adoption of modern and scientific methods of working.

In shaft sinking with machine drills the miner must place his holes with reference to the dip and strike of the rock in which he is working, if there is any "rift" to the rock at all. Failing this, the holes may not break nearly as much as was calculated. In massive ground, which breaks more or less indiscriminately in any direction, holes may be put in after a regular system in which the central or "cut holes" form an important factor.



## Precise Lining of Large Shafting.

Written for the MINING AND SCIENTIFIC PRESS by  
W. I. FLECK.

When large shafting is to be set, and the revolution per minute is high, or near the ordinary limit, it is of the greatest importance that centering of boxes

curve leaving the pitch line would equal about  $15^\circ$  and the parting strain equal two tons. The loss by friction would be more than doubled—i. e., the power resolves itself into two forces, one acting on the tangent of the pitch line and the other force acting perpendicular to it, at the point of nearest contact of the pitch lines.

One of the forces represents power and work, the

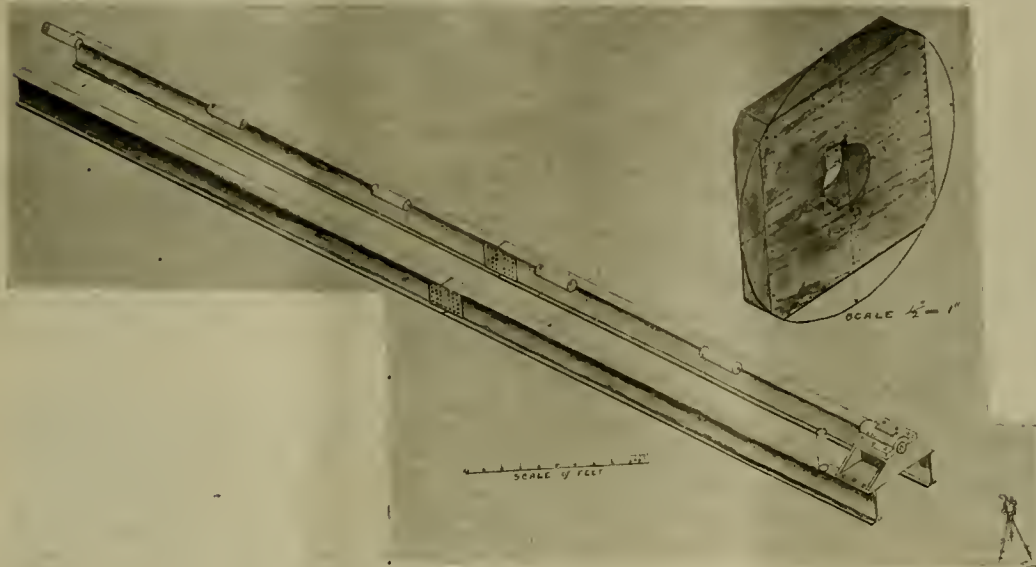


Diagram Showing Method of Lining Shafting.

be lined under conditions so they will remain in position under the working load. The details are given by describing a particular setting, which illustrates most of the important features of this method, some of which are thought to be original and ideal. The drawing shows the relative position of the horizontal and vertical boxing, shafting, gearing, etc., necessary for the transmission of 1600 H. P. from four water wheels through 60 feet of shafting, 7 inches in diameter, 360 revolutions per minute.

The horizontal bearing only will be considered, as the vertical bearings were lined by means of a vertical plumb bob and line in the ordinary way.

The bushings are phosphor bronze,  $\frac{1}{2}$  inch thick, 2 feet long, turned up true, and are not adjustable.

In each end of every bushing a crosswire frame was placed, and the crosswires centered by means of small dividers to within  $\frac{1}{16}$  inch. This was done after the block was set by moving the pins. As the wire was No. E violin string,  $\frac{1}{16}$  inch in diameter, this was easily done.

The hole in the crosswires block was  $1\frac{1}{2}$  inch in diameter, as shown, leaving room for light and numbering. There being six horizontal bearings and one crosswire for each end, the numbers read from one to twelve, in the order of their distance from the observer.

The final setting was done at once easily by means of a transit, which magnifies 24 diameters, set 7 feet in front of No. 1, which is in position. The problem is to make all conform, having two fixed points. When the focus of the objective is changed to No. 2 the crosswire No. 1 disappears, so there is no confusion to the observer.

The assistant holds a small scale reading to  $\frac{1}{16}$  inch successively in a horizontal and vertical position, parallel and near the wires.

The distance read on the scale between the two horizontal crosswires is marked off on the lower side of the box, if it is low, and on the upper side if high.

When the vertical wires are read the distance is marked on the right or left, and shows which way the box is to be moved. By changing the focus successively from one number to the other, all are marked off.

The boxes are changed approximately to their indicated position, then are checked over until the desired accuracy is obtained. As the transit magnifies 24 diameters and the wires are about  $\frac{1}{16}$  inch in diameter, assuming the objective to be tight, the error of alignment is slight, except for error of focusing, which can be checked by changing the transit to the opposite end. By suspending a plumb line over each vertical box and allowing the bob to swing below, these lines are adjusted by the transit and the vertical bushing adjusted by measuring the upper and lower end on four points with a pair of dividers, centering and placing in a vertical position. This part, however, is an indirect method. The shafting was very rigid and stiff; the bolted couplings were 18 inches in diameter, keyed on and turned up afterwards at the factory. They all went easily into place and were found to be in line after the running load.

Shafting for carrying bevel gears must be very stiff for assuming the teeth to run on the pitch line at the full load, and the average angle of all teeth engaged to be  $5^\circ$ . As the pull on the teeth equals eight tons from the parallelogram of force, the resistance or pressure to spring the shaft is approximately 1500 pounds. If the shaft should spring  $\frac{1}{8}$  inch, the

## Ditch Making in the Klondike.

The most important ditch on Bonanza creek, in the Klondike region, is the Norwood ditch, which was built by H. H. Norwood in the summer of 1904. George T. Coffee was consulting engineer and Rufus Buck civil engineer on this construction. The ditch will carry 1000 miner's inches, having a grade of 8.5 feet to the mile where ditch and flume are used and a grade of 40 feet to the mile for pipes, which are 24 inches in diameter. The ditch is located on the right bank of Bonanza creek, the point of diversion being at Claim No. 53 above discovery. The total length of the system is 6 miles, the water being used principally on the groups of mines on Gauvin hill and Magnet hill, which are owned by H. H. Norwood et al.

One of the accompanying engravings shows the reversible road plow benching off the side hill. This was found to be a very economical machine. The ground being cleared was plowed and then the road plow pushed the loose dirt off the grade. The ditch was then excavated in the "bench" thus prepared.

The second illustration shows the pick-and-shovel men excavating for the ditch.

The use of six horses on the road plow tends to settle the loose dirt on the outside bank, which is very good practice, as the ditch will certainly be stronger with a well packed bank.

The cost of such ditches varies, according to material and slope of hillside, from \$2000 to \$4000 per mile.

Labor received \$4 and board per day (\$2 being cost of board). Teams of two horses, with driver, were bired for \$15 to \$20 per day.

The future success of placer mining in the Klondike region must depend to a great extent upon hydraulic methods of mining. The water carried by this ditch will be used under 100-foot head in hydraulicking the gravels on Bonanza creek. The gravel is friable and easily washed when the frost is out of it, and 1000 inches of water under a 100-foot head will break down as much gravel as the water will carry away. The benches where these mining operations are to be carried on are 300 feet above the creek bed.



Grading Bench for Ditch With Road Scraper in the Klondike.



Cutting a Ditch After the Grade Has Been Made in the Klondike.



## Examination and Valuation of Mines.

In a recent lecture before the mining college at Otago University, New Zealand, Professor James Park of the geological department gave the following advice and information to the students of that institution, as published in the New Zealand Mines Record, and it may be read with benefit by all engaged in the mining industry:

The examination and valuation of a mine or mining property is work intrusted to the experienced mining engineer and not to the mining student. But the experienced mining engineer of twenty years hence is in the classroom to-day; thus it is necessary for the student of to-day to become early acquainted with the first principles of what will form the most important function of his profession.

The payable ore in a vein, or coal in a seam, is manifestly a certain finite quantity; therefore the greatest coal field and largest ore deposit must eventually see a day of exhaustion. And if the total quantity of ore or coal and the annual output are known, the date of exhaustion is a matter of simple calculation.

A mining property blessed with a good constitution—that is, endowed with a considerable quantity of valuable ore, from the date of discovery to the point of exhaustion—naturally passes through the successive stages of infancy, youth, full-grown manhood, middle age, old age and extinction.

Infancy is the discovery stage of mine existence; youth, the development stage; full grown, the payable going concern in the meridian of life; middle age, the going concern past the meridian; old age, the period of rapid decadence and exhaustion. But all this is true only of the mine that survives the early stages of existence and lives what may be termed a full and profitable life, leaving an honored name behind.

Some mines give promise of their later vigor even in early infancy, and others that are weakly in infancy develop into the most robust manhood. The greatest mortality takes place in infancy and youth. Scores of promising mineral discoveries are unable to survive the stage of development. They never become going concerns.

But sudden exhaustion is not an affection peculiar to the very old or the very young mine. There are many notable examples of vigorous mines coming to a sudden end through exhaustion of the ore reserves in a way not expected or provided for by the management.

The mine examiner will, therefore, like the careful physician, have an eye open for possible constitutional defects that may cause sudden decadence in even the most vigorous. A mining property may be examined by a mining engineer for the following objects: (a.) The purchase of mine by his principals. (b.) The purchase of shares or a share interest. (c.) Recommendations as to future development work.

The examination and valuation of a mine go hand and hand, but mine examination is a very different thing from mine valuation. Two independent engineers may examine the same property and collect the same data and information, but form quite different conclusions as to the prospective value of the property.

Experience and the personal equation count for much. The latter means that some naturally possess a sounder judgment and more discriminating mind than others; are better able to comprehend the meaning of facts, and hence more competent to form a true conception of a proposition presented to them.

The valuation of a mine is a prosaic, matter-of-fact problem requiring the exercise of the commercial faculty. Even in the most favorable circumstances the problem is not easy of solution, for the reason that some of the essential factors are often wanting, or merely represented by approximations.

For the purposes of examination, mining properties may be considered as belonging to one of three classes, as follows: (1) Metal mines; (2) coal mines; (3) alluvial mines.

**VALUATION OF METAL MINES.**—In the case of a property known to be metalliferous, or to contain some valuable mineral, the scope, and to some extent the method, of examination will be modified by the stage the mine has reached in its existence. The different stages in the life of a mine may be subdivided as follows: (1) Discovery stage; (2) development stage; (3) going concern stage; (4) decadent stage; (5) abandoned.

**DISCOVERY STAGE.**—In this stage we assume—(a) That a vein or ledge has been located by the prospector and a legal title obtained for the ground, forming what may be termed a surface show; or (b) that the claim has been pegged out on position alone, no vein or seam of valuable mineral being exposed at the surface.

**A SURFACE SHOW.**—In this case the outcrop has probably been prospected by trenches and shallow shafts sufficient to disclose the width, direction of the strike and dip of the deposit.

Having provided himself with the best topographical and geological maps obtainable, the mine examiner will proceed with his examination, which will

embrace a consideration of the following points: (a.) The geological features. (b.) The physical features, particularly with reference to the subsequent working of the property, should the results warrant this course; note such points as the backs available—that is, if the vein can be worked water free; but, if not, mention if sinking is likely to be wet or dry; mine timber and water power available, etc. (c.) Sample the outcrop at different points, noting the width of vein and peculiarities of structure. (d.) Mention the proximity, or absence, of valuable or worthless mines in the district. (e.) Make inquiries as to past history of the field, obtaining official statistics when possible. (f.) Gain a personal knowledge of the local peculiarities of the ore deposits in the neighboring mines, especially noting vein structure, average width and value of ore, accessory minerals, country rock, influence of different kinds of country, faults, intrusive dikes, methods of treatment, monthly output, mining costs, etc.

When once on the ground, the mine examiner should make a point of acquiring all the general and particular information he can obtain for his future reference and guidance.

The results of the sampling and observations may be satisfactory, but the experienced mine engineer will be careful not to commit himself to a definite opinion as to the potential value of the property upon surface indications alone. The young engineer must not be afraid to report to his principals "that the development work is insufficient to enable me to form a definite opinion as to the probable value of the property." The experienced engineer finds no difficulty in doing so.

If the outcrop values and general surroundings are satisfactory, the examiner will, in most cases, be warranted in recommending further development work being undertaken in order to open up the ground for a fuller examination. The mine examiner, from his knowledge of the ground, will be able to indicate to his principals the nature, extent and probable cost of such work.

In this case it will manifestly be to the interest of the intending purchasers to acquire a working option over the property for a period of six, nine or twelve months, or, may be, if the work to be undertaken is considerable, two years.

The deed of option should be legally executed between the interested parties; clearly specify the terms of purchase, and state which party is under obligation to pay rents, taxes, royalty and comply with the labor regulations, etc., during the currency of the option.

The vendor may sometimes acquire an immediate cash payment of an agreed sum of money on the execution of the deed of option, such sum to be considered part of the purchase money should the property be taken over; or he may covenant that a certain specified sum be spent in mine development, either monthly or during the whole period of the option, as a guarantee that the work will be prosecuted with vigor.

It should be remembered, however, that the engineer for the purchaser is generally the best judge as to what sum should be spent in the development work necessary to enable him to form a reliable opinion of the value of the property. On the other hand, the chance of doing good business should not be lost by pursuing a niggardly policy with the vendors. Therefore, each case must be judged on its own merits.

So far we have assumed that the surface outcrops gave sufficient values to warrant further development being taken, with a view of opening up the ground for a more critical examination. According to the configuration of the surface and position of the outcrops, the ore vein will be prospected by levels driven "end-on," i. e., along the course of the ore body; or by crosscuts and levels therefrom; or by a shaft or shafts.

In selecting the sites for the aforesaid level or shafts it is in most cases advisable to keep in mind the possibility of these works being utilized in the permanent working of the mine, should the results justify this course.

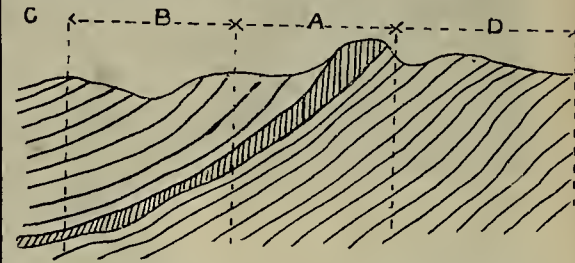
Again, the surface outcrops may be worthless and the prospects insufficient to warrant any expenditure on prospecting. On the other hand, the value of the property may be so obvious that the mine examiner is justified in recommending the immediate purchase. In this case no prospecting should be undertaken by the examiner until a firm option of purchase has been acquired on bedrock terms.

Undeveloped properties of such obvious value are rare, and hence extreme caution must be exercised by the examiner before recommending an immediate purchase. Ledges of silver-lead ore and gossans of pyritic ore bodies have been discovered in situations that left little room for doubt as to their great value, even from surface sampling and examination; and the same has proved true of not a few valuable deposits of magnetite, specular iron and manganese.

But even if the examiner have the immediate purchase of the property in his mind, he will seldom have much difficulty in obtaining the right (under an option of purchase) to spend a month or two in sampling and surveying preparatory to the completion of the purchase.

**STAKED ON POSITION.**—This is generally an undeveloped property, often possessing no surface indica-

tions of valuable ore or mineral. In some cases position means everything; in others it means nothing. For example, an area surrounded by working coal mines, iron mines, or oil wells occurring in the same formation, in the absence of faults or igneous dikes, is an area already proved valuable by its juxtaposition to valuable mines. Or a claim pegged out on the strike of a lode that has proved to be payable up to the boundary is a potentially valuable property. Or a claim pegged out on the dip of a flat-lying lode, seam, or bed that has proved to be valuable by the outcrop mines is a property, in the absence of great faults, igneous dikes, or a change of rock formation, that may prove to be of great value.

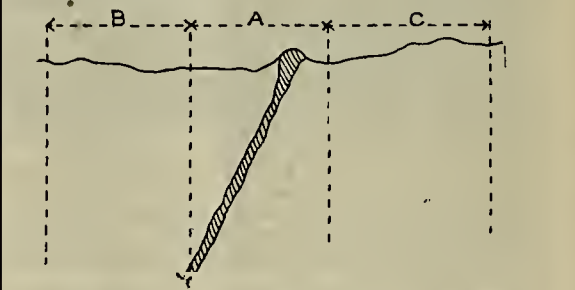


In the above figure, A is an outcrop claim assumed to be valuable. Here B and C are claims pegged on position, and their potential value will depend upon the value and characteristics of the ore body as disclosed by the mine working in the outcrop claim.\*

Manifestly the value of claims B and C can only be determined by shafts or by bore holes. In the majority of cases boring will be resorted to as being cheaper, quicker, and affording the means of testing the deposit at a greater number of points.

Claim D has been pegged out on position. It is next to the outcrop claim, but being situated on the footwall side of the deposit its position counts for nothing.

In the case of steep lodes, claims pegged out on the dip side may be worth little commercially, from the extreme depth at which mining operations would have to be conducted.



In this example claim B may be for all practical purposes of no more value than claim C.

The valuation of position properties presents many difficulties. The mine examiner will therefore need to make a critical examination of the ore bodies in the adjoining mines, of the geological structure of the country, and a particular search for any change of country, dikes, or faults.

The points which the examiner will bring under the notice of his principals are as follows: (1) Situation of claim and means of access; (2) area of claim and name of owners; (3) title—i. e., leasehold or freehold—with particulars of rents, royalties, labor conditions, etc.; (4) geological features; (5) physical features, mentioning climate, forests, water power, etc.; (6) particulars of vein outcrops, prospecting work done; (7) values obtained from sampling; (8) discussion of general surroundings; (9) opinion as to future prospects, and recommendations.

Three courses may be pursued, according to the circumstances—i. e., the property may be—(a) Rejected; (b) secured on working option; (c) purchased.

If the engineer recommends that an option be secured, he should give full details of the character and extent of the proposed work, its probable cost, time required for the work, its effect when completed, and proposed method of supervision.

**DEVELOPED MINES AND GOING CONCERNS.**—The commercial valuation of a mining property in this stage is based upon the following considerations: (a) The quantity and value of ore in sight; (b) the net profit per ton; (c) the annual output to yield a net profit per cent on a certain capitalization; (d) the probable life of mine.

The quantity of ore that might be expected to be opened up by further development work must not be lost sight of. But the quantity and value of such ore are unknown quantities, and the importance to be attached to them in calculating the mine value must in every case be determined by the character of the ore body and the value of the ore already developed and won.

Some veins are notoriously patchy, while others are equally consistent as metal producers; hence no safe rule can be laid down as to the prospective value of undeveloped ground. The local conditions must

\*There are no extralateral rights in New Zealand.



govern each case. It is, however, well for the engineer to remember that the ore values of vein deposits are more liable to sudden variation than those of bedded deposits.

As in the former cases, the mine examiner will proceed to the ground equipped with the best topographical and geological maps obtainable; also official reports and statistics, if any are available.

The examiner's outfit should also include the following: (a) Sampling appliances. (These will be described later on). (b) Prismatic compass, 3 inches in diameter, preferably provided with metallic card. (c) Pocket compass, geological pattern. (d) Level. (e) Measuring tape, 50 feet or 100 feet. (f) Where practicable, a photographic camera, if only a kodak.

When once on the ground, the engineer will find it advantageous to pursue the following course of procedure, although it must be clearly understood that circumstances alter cases. The suggestions given here are general rather than special, and must be modified to suit the needs of each case:

(a) Carefully examine the mine plan. Get the mine manager to explain the general scope and extent of the underground workings.

(b) Examine the surface outcrops, if any, and note the geological and physical features.

(c) Examine the boundary lines and carefully note their position with respect to the dip and course of the vein ore body or seam being worked in the mine.

(d) Note the relation of the underground workings to the surface boundaries.

(e) Have a look at the ore coming to the surface, also at the rock on the dump.

(f) Examine and make a note of the surface equipment, including mills and all metallurgical plant and appliances. When describing steam engines, give the number and size of cylinders, maker's name, pressure of steam carried by boiler, etc.

The first day or two is spent in getting your bearings, and becoming acquainted with the manager and noting what kind of a man he is. A few days occupied on the surface in preliminary work is generally time well spent. Make a note of any facts presented or offered to you. Do not note opinions, and on your side be careful to offer none.

(g) Examine the underground workings accompanied by the mine manager or his deputy. According to the extent of the workings, it may take a day or two to do this.

(h) Again examine the mine plans. You will be able to follow them intelligently from the information you have gained underground.

You have now reached the critical stage in your examination. You have next to determine the condition of the mine; and among the questions that will naturally come into your mind will be the following: (1) Is this a young mine with a prosperous future ahead of it? (2) Is this a young mine doomed to early exhaustion? (3) Has this mine reached its maximum point of production? (4) Is this an old mine approaching exhaustion? (5) Is this an old mine with "eyes picked out?" The answer to these questions is to be found in the quantity and value of ore in sight. Do not forget that in a vigorous, well-managed mine the development work will be commonly two years ahead of the mill.

(i) Go underground with your own assistant, and sketch out your scheme of sampling.

(j) Sample the mine in a systematic manner. This may take a week or several weeks, according to the magnitude of the workings and size of ore bodies. (The general principles of mine sampling are described in the section treating of "Mine Sampling and Ore Valuation.")

(k) Complete your surface investigations. Get mine returns of output of ore and values extracted, or of mineral shipped or exported, mining and milling costs, etc. Carefully verify doubtful points.

(l) Before leaving the district make as complete an examination of the neighboring mines as circumstances will permit, noting character of country, ore bodies being worked, general characteristics of said ore, output, returns, methods of treatment, costs of mining and milling.

On no account allow yourself to be hurried in your examination. Take your own time. Cultivate a deliberate temperament. Base your estimates on facts, but be sure of your facts; and in your report be careful to differentiate between facts and opinions.

Your next care is the assay of your mine samples, and in this you must be guided by local considerations. If you are a skillful assayer, it is preferable for you to hire an assay office for a day or two, supply your own fluxes, crucibles, etc., and perform your own assays; or your assistant will probably be able to do so for you. In whatever way the work of assaying is done, it is imperative that the results must be accurate and reliable.

(m) Plot your assay values on tracings of mine plans, and then consider the results.

The form of your report will depend upon your recommendations. Manifestly the property may be—(a) Rejected; (b) secured on option; (c) purchased at once.

If, in your opinion, the property should be rejected, it will be unnecessary to furnish elaborate details concerning it. But if you recommend its purchase, it will devolve on you to supply information upon the following points: (1) The situation of property, and its relation to any valuable or worthless

concerns in the vicinity. (2) Means of access, with particulars of roads, railways, waterways, distances from centers of population, etc. (3) The area, owners, and names of old claims, if any, included in the area; history, nature of title, labor obligations, etc. (4) Physical features, including particulars of rivers, mountains, forests, rainfall, water power available, etc. (5) General geological structure: detail the rock formations present, their probable age, relations, disposition and distribution. (6) Description of ore bodies or mineral deposits, with particulars as to their position with respect to boundaries of prospect; their dimensions, dip, strike, outcrop, etc. (7) Description of old workings, if any. (8) Character and extent of present workings. (9) Quantity and value of daily output of ore. (10) Quantity and value of ore in sight. (11) Method of treatment of ore, or of disposal of mineral. (12) The cost of mining and treatment. (13) Probable net profit per ton, and per annum, on a specified annual output. (14) Probable life of mine with a specified annual output. (15) Description of present mining and metallurgical plant and appliances. (16) Development work recommended, if any, and estimated cost. (17) Details of additional plant, if any required. (18) Recommendations as to management of property. (19) Schedule of prevailing salaries and wages. (20) Schedule of mine supplies required, and their cost delivered at the mine. (21) Local and general rates, import and export duties, insurance, income and other taxes. (22) Number of working days in the year. (23) Climatic conditions and prevailing sickness, if any. (24) Mining legislation of country. (25) Amount of working capital required to develop mine to a paying point.

(TO BE CONTINUED.)

### Cameron Pumps in the Brooklyn and Manhattan Tunnel.

The accompanying illustration shows the Brooklyn and Manhattan tunnel pumping station on the Brooklyn side in the tunnel, now in course of construction under the East river, the Brooklyn shaft being at Furman and Jaroleman streets, to connect the Brook-

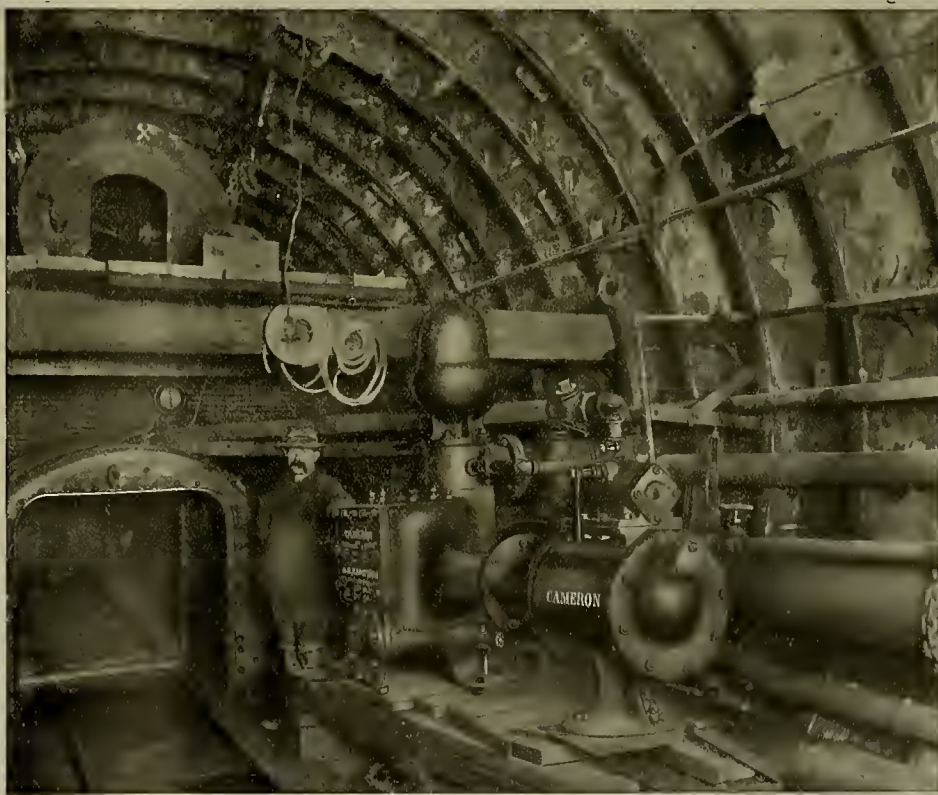
in case of the flooding of the tunnel. The accumulation of water in the excavation is forced out of the air chamber by means of the air pressure through a pipe built within the bulkhead, the water thus falling to a sump outside of the wall, from which it is pumped to the surface, the lift being 60 feet. Owing to the water being very dirty and gritty the water cylinder of this pump is supplied with a removable iron bushing. The pump is operated by compressed air, the exhaust of which is delivered into the compressed air chamber of the tunnel, where it is again utilized.

W. I. Aims is the engineer in charge of the work for the New York Tunnel Co., and to him we are indebted for the foregoing information and illustration.

### New Carborundum Products.

Attention is being called to the utilization as a refractory material of carborundum, which is produced by fusing coke and pure silica in the electric furnace at Niagara Falls, says the American Manufacturer. As an abrasive carborundum has already established the reputation of being superior to emery by reason of the fact that 1 pound of the former equals 3 pounds of the latter, relatively speaking. From 8 short tons reported in 1893, the production of carborundum has increased to 5300 tons in 1904, while the price influenced by the larger domestic and European consumption has fallen from an average of \$2125 per ton to \$200 in eleven years. At present carborundum grains are quoted at 10 cents per pound and powder at 8 cents f. o. b. Niagara Falls, New York. The expansion in production and the large discount in selling are suggestive factors that indicate the competition of carborundum with emery carborundum, crushed steel and like abrasive materials.

In recent years several patents have been issued in this country and abroad for refractory brick, cement and other articles whose principal constituent is carborundum. Generally speaking, pulverized carborundum is mixed with a binder of clay, an alkali silicate and lime. In patents issued to the Carborundum Company (Great Britain, 9963 of 1904) and to Frank J. Tone (United States, 772,262), however, no



Cameron Pump in the Brooklyn and Manhattan Tunnel.

lyn subway with the Interborough Rapid Transit subway at the southern end of Manhattan island in Battery park. The overhead construction of the tunnel is shown with the sectional cast iron lining.

A Cameron regular pattern piston station pump, 14x10½x18 inches, of the light service type, is in position in the tunnel about 100 feet from the Brooklyn shaft. On the left hand side will be noticed a bulkhead, consisting of a solid brick wall built across the entire tunnel, and 3 feet thick, heavily braced with timbers, forming the compressed air chamber situated on the further side of the bulkhead, where the air pressure is maintained at twenty pounds per square inch. The tunnel is being driven by the pneumatic shield method. The entrance into the workings of the tunnel is through the two air locks shown in the view. The lower air lock, 6 feet 6 inches in diameter, is used for the exit of material, which is removed by cars on a trackway. The upper air lock is an emergency lock for use by the men in escaping

admixture is used, the cohesion required being attained by subjecting the superficially oxidized particles of crystalline or amorphous carborundum at a high temperature in an electric furnace.

Aside from the regularly shaped refractory articles, carborundum fire sand, specific gravity 2.7, mixed with No. 1 fire clay and a solution of sodium silicate, serves excellently as a coating or lining for brass, lead, copper or other high temperature furnaces. Advantages claimed in this direction are simple construction, by molding the entire lining into place, freedom from joints, and durability. Carborundum fire sand is worth \$1.05 per 100 pounds f. o. b. Niagara Falls, which is much less than the cost of ordinary fire clay.

As a mixture in steel (French patent 344,906, July 3, 1904), W. Kaufman and A. Bouvier state that the silicon carbide is introduced in equal quantities at regular intervals into the molten metal as it runs into the ladle or mold.



## Lodgepole or Tamarack Pine.

The lodgepole pine, which is known in the Sierras of California as tamarack pine, and in Colorado and Montana is sometimes called white pine, jack pine, pinon and scrub pine, bears the common name of "lodgepole" from the fact that the Indians used its long slender trunks as supports for their wigwams or lodges. Its geographical range is along the Rocky mountains from Alaska to New Mexico and westward to the Pacific coast. In the United States it is found in merchantable quantity and dimensions on the spurs and eastern slopes of the Rocky mountains throughout southern Montana, Wyoming and Colorado, in the Bitter Root mountains of Idaho, the Uintah range in Utah, and in the Big Horn mountains of Wyoming. The Bureau of Forestry is studying the species throughout this range of its best commercial distribution.

Lodgepole pine grows at all altitudes between 3000 and 15,000 feet above sea level. In the Gallatin mountains of Montana and in the mountainous country south and east of Yellowstone park it reaches its largest size at elevations between 4500 and 8000 feet. In Colorado, however, towards the southern limit of its range, the conditions which are necessary to its best growth are found between 9000 and 10,500 feet elevation.

Lodgepole pine is valuable, for one reason, because it grows on high mountain slopes, and also on old "burns," where other trees find difficulty in obtaining a foothold. It readily adapts itself to most diverse soil conditions, but thrives best where there is considerable moisture. Its roots accommodate themselves to the shallow soil common in the localities where it grows. At a very early age this tree produces cones in large quantities, and after it is ten years old the seed are generally fertile. The cones sometimes open and distribute the seeds as soon as they are ripe, though more commonly they remain on the trees for years with their seed carefully preserved beneath the scales. In many cases squirrels cut off the closed cones and hide them away in the ground. If a fire occurs before the seeds are eaten, it will cause the cones to open and set them free. As a rule, however, the cones of many seasons remain on the trees until a fire comes along, and, by heating them, liberates the seeds, when a dense growth of seedlings follows.

The wood of lodgepole pine is light yellow to nearly white in color, with a coarse but straight grain. It is soft and easily worked, and would make excellent finishing lumber were it not for the abundance of small though hard knots, and for its tendency to warp and check with seasoning. Without doubt the best use of lodgepole pine at present, and the one to which it is most largely put, is for railroad ties and mine props; but to be utilized with the greatest

profit for these purposes the timber must first be subjected to preservative treatment. The Bureau of Forestry has for some time been conducting in Montana and Wyoming exhaustive tests in seasoning and in preservative treatment of this pine, and a comprehensive bulletin on this subject is now in preparation.

During the season of 1903-4 between 1,300,000 and 1,400,000 lodgepole ties were cut, most of which were treated with preservatives. The cut of this season will exceed this number, and without doubt the use of lodgepole pine for ties will increase yearly. Trees between 11 and 14½ inches in diameter breast high are hewed; those larger are logged and sawed, as the hewers refuse to work them. When a tree reaches 11 inches in diameter it is mature for ties; this makes it possible to remove a quantity of material from the dense natural forests as soon as a number of the trees have reached that size, and thereby to stimulate the smaller ones to a more active growth. At the same time a new generation may be started in the openings from the seed of the felled trees.

Great quantities of lodgepole pine are also used for props in the numerous mines in the region where this tree grows. The timber is cheap and in its natural condition answers for temporary purposes in mine development; when well seasoned or treated with preservatives it may be used for permanent con-

struction. Miners use poles as small as 5 inches in diameter at the top, and this demand for small timber works another advantage to the forest in that it offers a means of utilizing the upper parts of trees cut for lumber, which in the ordinary way of logging are left on the ground to become dry and increase the danger of fire. It also makes possible the thinning of pole stands which contain few or no trees large enough for ties, but which are so dense that the trees have almost stopped growing. The accompanying illustrations show the characteristic growth of the tamarack trees in the high Sierra of California.

By far the larger part of the merchantable lodgepole area is within existing or proposed Federal forest reserves, where the lumbering regulations which the Government put into effect some time ago will protect and benefit the forests.

Other objects of the Bureau of Forestry in this study are to ascertain the rate of growth of the tree, and how it may be increased; to better existing lumbering regulations; to devise a system of fire protection; and to extend the commercial uses of the wood. A controlling consideration is the need of maintaining the forests on all the mountains they now cover and of causing them to spread more widely, if possible, since the most important function they can perform is to safeguard the watersheds they include. This study will enable the Bureau to carry out more effectively the work of forest reserve management lately intrusted to it by Congress. The results of the study should also prove of large value to railroads and private owners, who hold a great many odd sections of land all through the lodgepole pine region.

For good behavior in construction, cement must possess two essential qualities—strength and soundness—says W. P. Taylor in the American Manufacturer, and the primary object of all testing is to determine whether the cement is satisfactory in these two important particulars. The other tests of fineness, specific gravity, time of setting and chemical analysis, are chiefly of value as the results give additional information as to probable strength and durability of the material. The precision and accuracy possible in any one of the physical tests vary inversely with the importance of that test. Thus, soundness is the most essential quality, and yet the ordinary tests for soundness are the most inexact and the most dependent upon personal judgment. In the tests for strength we have all the errors due to the personal equation of mixing, molding, handling and breaking, which make this test one of experience. In the time of setting these inaccuracies are still further reduced on account of the simpler processes required. In the fineness test, which is less important than the preceding, we reach the first test capable of some accuracy, and in specific gravity, which in itself has almost no importance, we reach the only test that can be considered capable of precise determination.



Meadow and Tamarack Trees Near the Headwaters of the Tuolumne River, California.



A Sagebrush Slope in the Sierra Region of Mono County, California.

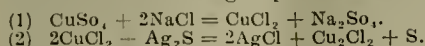


## Effect of Salt and Bluestone on Mercury in Pan Amalgamation.

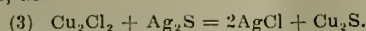
Written for the MINING AND SCIENTIFIC PRESS by  
A. E. DRUCKER.

There has been some doubt whether bluestone and salt were really needed with the pan process in treating silver ores. It must be remembered that salt and bluestone are only necessary when silver sulphide ( $\text{Ag}_2\text{S}$ ) is present in the ore so as to change it into the chloride ( $\text{AgCl}$ ), in which form it can be readily reduced and amalgamated. Ores containing silver in the form of chloride only or native silver do not require bluestone. I believe salt is always beneficial, as it greatly increases the reduction of  $\text{AgCl}$  by iron, on account of the chloride being somewhat soluble in salt and increasing the surface of attack for the iron. The fine iron particles—caused by the wearing of shoes upon the dies—certainly are very important towards reducing the  $\text{AgCl}$  to metallic silver.

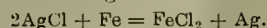
It is understood that the following reactions take place in a pan, and they show the need of bluestone and salt with ores containing sulphide of silver:



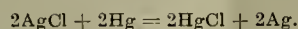
Cuprous chloride acts on any unchanged silver sulphide, as:



Equation (3) is the main reaction towards reducing  $\text{Ag}_2\text{S}$  to  $\text{AgCl}$ . Now the part the iron particles play is shown in the following reaction:



Also, to a slight extent, mercury reduces  $\text{AgCl}$ , or that portion which is soluble in a strong solution of salt, as:

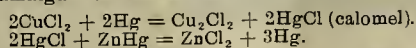


The silver is then amalgamated. I may go on and give many other reactions, and I believe there is no limit to them, but these are the most important ones that do take place.

Large losses of quicksilver occur through flouring, when large excesses of bluestone are used in the pans—more than is needed to convert the  $\text{Ag}_2\text{S}$  into  $\text{AgCl}$ . This has been one of the main sources of trouble in most mills, more bluestone being used in the pans than is really necessary. The amount of bluestone for each charge day by day is told by a simple test on the amalgam obtained. Take an average sample of the amalgam (1 gram) and dissolve in 3 c.c. of strong nitric acid. Add ammonia until a blue color is shown. Regulate the bluestone so as to always have a faint blue color. By doing so, a very pure bullion and a better extraction will be obtained. Large excesses of bluestone are harmful to the amalgamation of free gold.

An excess of cupric and cuprous chlorides causes a flouring of the quicksilver, coating it with a film of chloride of mercury ( $\text{HgCl}$ ), thus preventing finely divided mercury from uniting. This may be plainly seen by trying an experiment in a bottle with mercury, bluestone, salt and water and shaking well. As I have said before, the mercury will be subdivided and the subdivision will continue with agitating until floured quicksilver results. The particles of mercury are coated with a dull gray film of chloride (calomel). The coating formed by boiling mercury with a bluestone solution is not the same. It must be a sulphate of mercury film. Now the same thing is bound to take place in a pan where a large excess of bluestone is used. The ore is charged into a pan and water added to give it the proper consistency; next an excess of salt (20 pounds) is added, and the required amount of bluestone—with Tajo ore 12 to 16 ounces. The miller is lowered so as to grind for a certain length of time, and it is during this period that the chemicals are supposed to do their work of changing the silver sulphide over to the chloride ( $\text{AgCl}$ ). The bluestone no longer remains as  $\text{CuSO}_4$  sulphate, but is changed to  $\text{CuCl}_2$ , as shown in equation (1) above. When  $\text{CuCl}_2$  acts on  $\text{Ag}_2\text{S}$ , cuprous chloride ( $\text{Cu}_2\text{Cl}_2$ ) is formed, and it is the action of either of these chlorides of copper—not the sulphate ( $\text{CuSO}_4$ )—on mercury that causes the calomel film ( $\text{HgCl}$ ) to form on quicksilver particles, causing flouring. I have made an analysis of some of this coating and found it to be the chloride of mercury. This chloride was found with the Comstock tailings, and, after cyaniding, considerable mercury was saved. The chloride could be saved by cyaniding but the floured mercury could not.

In my article published in the MINING AND SCIENTIFIC PRESS on April 15th last I spoke of zinc amalgam being used as a means of destroying the calomel film, causing floured mercury to reunite. Zinc amalgam also cleans mercury and causes it to be very active. It seems to act in the same way as sodium amalgam on quicksilver. Since copper sulphate is charged into the pan with a large excess of salt and is changed into cupric chloride shortly, then zinc chloride ( $\text{ZnCl}_2$ ) must be the result of the reaction of zinc amalgam on the calomel film as:



You cannot prevent the chloride of copper in solu-

tions from being reduced by any fine iron particles to metallic copper, especially if large excess of bluestone are used in the pans. The reduced copper is readily amalgamated by the quicksilver, and I will say again that only a slight excess of bluestone should be used in the pans over that necessary to convert the  $\text{Ag}_2\text{S}$  into its chloride. Large excesses will only result in very base bullion and low extractions. Mercury charged heavily with copper readily becomes coated by iron particles, and in the pulp it is readily coated by iron pyrites, lead and slimes. Any substance coating the mercury and keeping it dirty will interfere with amalgamation and increase the loss of quicksilver. I don't believe that mercury full of copper, which is bound to make it sluggish, can do good work. It only crowds out the precious metals.

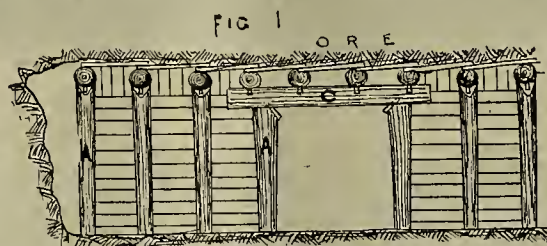
While treating fresh and oxidized concentrates I found that the amalgam obtained from working old oxidized concentrates was quite pure, with very little copper, while that obtained from fresh concentrates was base, with copper. Now the only reason I can give for this, that in cases of oxidized concentrates the iron particles (from wearing of shoes and dies), contained within the concentrates were oxidized to ( $\text{Fe}_2\text{O}_3 + \text{H}_2\text{O}$ ), and in that form could not reduce the copper chlorides in solution. Hence we got practically pure amalgam, the copper remaining in solution as a soluble chloride ( $\text{CuCl}_2$ ) unreduced. But with fresh concentrates just from the mill and containing plenty of iron particles unoxidized, the copper chloride solution was reduced to metallic copper and amalgamated, giving naturally coppery amalgam.

The question has been asked, What class of ores does the bluestone help to amalgamate? All silver ores containing silver in the form of sulphide ( $\text{Ag}_2\text{S}$ ), and in this case it is very necessary. Bluestone does no good in the case of silver ores containing all the values in the form of silver chloride ( $\text{AgCl}$ ) or metallic silver; it only does harm in this case. The pan amalgamation process certainly can be improved upon, and it has by no means reached a state of perfection.

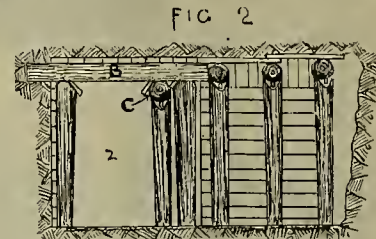
## Methods of Mine Timbering.

TO THE EDITOR:—As some of your readers may possibly be interested in a description of the methods of timbering as carried out in the Furness hematite deposits (in the north of England), where the writer

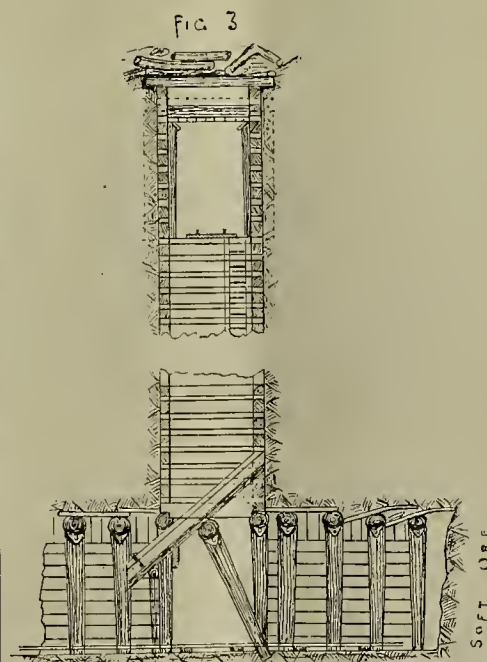
ing the ore is continued, the surface is allowed to subside and gradually follow the mining operations as they are continued downwards. The timbers most generally used in the district are larch and Swedish and Norwegian pine, but American pine is often used for shaft timbers and head frames. The method of supporting the main levels is by two props locally termed "forks," 7 feet long, supporting a cap 9 feet long, called "headtree." These timbers are 9 inches in diameter and form a set, and are spaced at intervals of from 12 inches to 3 feet center to center, according to the character of the ground. The props are faced or collared, i. e., hollowed out as shown in sketch, to allow the cap to receive a full bearing surface. To guard against side pressure a wooden plug called a "nog" is driven into the cap, close to the face of the prop, and when the side pressure is great a 9x3-inch stretcher is firmly wedged between the props and close to the caps for additional security. The workings must be timbered within 3 feet from the face. Spiles 1x4 inches cut into regular lengths are driven over the caps, to hold back the loose ground, old timbers and clay forming the roof. Where the ore is soft spiles are also driven behind the props at the sides of the level. When breaking out a new height of workings, in order to make more working faces, side workings are turned off (as shown in Fig. 1) at regular intervals, and the ore is split up into pillars. A heavy cap c (Fig. 1), called an "uptaker," supported by suitable props, is put in under the ends of the caps, at the side of the level from which it is intended to turn off the new working. This "uptaking" set usually takes in and supports four caps, and the two center props are removed after the uptaker or heavy cap is firmly fixed in position. Raises are put up vertically through the ore, and are usually 6x4 feet in the clear, with two compartments, one division being used for hoisting or lowering timbers, also for manway, ladders being placed at convenient angles and platforms at regular intervals. The raises are timbered with 5 and 6-inch square Norway pine, and between each set of timbers a 3 inch block is inserted at the corner, so that a space is left between each set to put a stage plank should it become necessary to repair the raise at any future time. The method of boring a hole in the cap, and fixing nogs to support the props, is very simple and effective, but there is no doubt it has the effect of weakening the cap and has often been criticised.



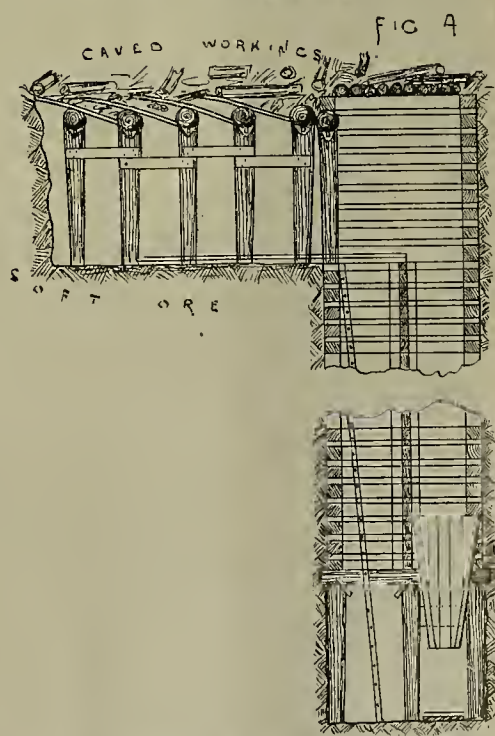
Side Workings.



Main Level.



Raise.



Raise to Caved Workings.

spent five years as superintendent, the following is offered: These ore deposits are basin-like in form, surrounded by and enclosed in a hard, compact limestone, and have a covering of glacial drift, locally called "pinel." This covering varies from 60 to 200 feet in depth, and is boulder clay. The ore being soft and gravelly is worked from the top of the deposit, immediately under the clay roof, downwards until the bottom is reached. As the work of extract-

Some years ago the square-set method of timbering was adopted at one of the larger mines in this district, where the deposit was 120 feet thick, and was found highly successful where the ore was hard and compact, but it did not answer in the soft gravelly ores. This method was finally abandoned in favor of the one previously described.

Jos. LANCASTER, E. M.

Butte, Mont., May 2.



## Mines of Bisbee, Ariz.

The largest producer of copper in the Southwestern United States today is the Warren district, of which Bisbee is the center. The mines are mostly in the vicinity of Bisbee, and the reduction works at Douglas. Up to 1880 Bisbee was considered a lead camp, the principal mine at that period being the Hendricks, just south of the present town. The mine produced lead carbonate, which was smelted in a small furnace built where is now the main street of the village. The Copper Queen mine, to which is due most of the large copper production of the district and also its fame, was discovered in 1877 by Hugh Jones, who, however, failed to realize its worth and allowed his claim to go by default, it having been relocated by Geo. Warren and some others. It is said that later Warren wagered his share of the mine on the result of a foot race and lost. Such is the fortuitous experience of many a prospector. In 1880 an option to purchase the mine was given to Ballard, Martin & Reilly, and they at once began operations. After a little work a large body of rich copper ore was opened and the ore was worked by open-cut method. Later an incline was sunk to a depth of 300 feet in solid ore, and thus began the de-



Some of the Mines of Bisbee, Arizona.

velopment of one of the most noted ore bodies in the world. The first reduction plant consisted of two water jacket furnaces, 36 inches diameter, and with these, using wood as fuel, about 500,000 pounds of copper were produced monthly, from ore which

averaged 23%. The ore was self-fluxing, there were no sulphides, and it was one of the simplest metallurgical problems to be found in the West, paying largely from the day the furnaces were blown in. The mine continued to make a large and steady production from this original ore body up to 1884.

The Neptune mine, situated just east of the Copper Queen, began work at about the same time as the latter, and had a single furnace on the San Pedro river at Hereford.

Other companies were soon afterward organized to work various properties of the district, prominent among which were the Copper Prince and Atlanta. Benson was at first the nearest railway point, and all freight was taken to the mines by teams.

In 1884 the first ore body opened in the Copper Queen mine was exhausted at the 300 level, but after a little exploratory work a second ore body was found in both the Copper Queen and the Atlanta mines. The properties were then consolidated as the Copper Queen Con. M. Co., and soon thereafter the property of the Copper Prince Co. were added to the holdings of the Copper Queen by purchase, followed later by the absorption of several other mines of the vicinity. In 1884 the average value of the



Calumet & Arizona, Bisbee, Arizona.





View of Bisbee, Arizona, in 1880.

ore was about 12%, the metal selling at that time in New York at 18 cents. In 1886 three new 36-inch furnaces were put in to replace the old ones, and an 80-inch furnace was also built. After this, the larger furnace giving the greater satisfaction, the size of furnaces was increased from time to time. Concentration was tried with favorable results, but the jigs were afterward abandoned. As the work of mining continued the rich ore deposits at and near the surface were gradually exhausted, and as the workings went deeper the ore became lower and more base, as the sulphide zone was entered. Transportation expense increased and it was determined in 1887 to build a railroad, and accordingly grading on the roadbed was begun in that year to connect Bisbee with the Southern Pacific at Fairbank.

The metallurgical problem became daily more important as the percentage of sulphide ore continued to increase and the oxidized ores to become more scarce. Con-

verters were introduced in 1892, and matte smelting and conversion of the matte became the process at these properties.

Up to 1900 the Copper Queen combination was the only important producer of copper in the district, but about that time the Calumet & Arizona Co. came into the field and in the four years following developed a large and valuable property, proving that, although first in the field and with a vigorous career extending over a period of twenty years, the Copper Queen Co. had not found all the copper-bearing ground in that district. The Copper Queen Co. built a new line of railway, the El Paso & Southwestern, connecting Bisbee with El Paso, Tex., a distance of 240 miles.

The smelters at Bisbee becoming too much cramped for room, both the Copper Queen and Calumet & Arizona companies built new and extensive reduction works at Douglas, 26 miles from Bisbee.

Two of the accompanying illustrations show views of Bisbee. The other two show the Copper Queen and the Calumet & Arizona mines with their extensive surface equipment. The hills were formerly covered with junipers and oaks.



Bisbee, Arizona, in 1904.



## Cyaniding Copper-Bearing Gold Ores.

The treatment of siliceous gold-bearing ores, in which no elements are distinctly recognized as detrimental to the cyanide treatment of ores, has made great advancement since it was first introduced about fifteen years ago. Knowledge has been gained by a broad and constantly increasing experience, and also to a great extent through the careful and exhaustive research and experimentation of specialists in this department of metallurgy. Ores containing copper in any other form than the unaltered fresh sulphide (chalcopryrite) have, however, been recognized as offering many drawbacks to the successful application of the cyanide process in extracting the gold values contained in such ores. For years it has been known that ammonia, when associated with cyanide of potassium solutions, had a desirable effect in the treatment of gold ores containing copper. As early as 1884 J. W. Simpson filed application for a patent to treat gold-bearing ores by the combination of potassium cyanide, ammonia and salt. The language of his patent application is in part as follows:

To carry my invention into effect, I first grind or crush the ore containing the metal to be extracted to a powder of more or less fineness. This powder is then treated with certain salts in solution adapted to combine chemically with the metal in said ore and form therewith a soluble salt. After thorough agitation to mix the solution with the ore, the mixture is allowed to stand until the solid matter is settled and the solution has become clear. I then suspend a piece or plate of zinc therein, which causes the metal dissolved in the salt solution to be precipitated thereon, from which it can be removed by scraping or dissolving the zinc in sulphuric or hydrochloric acid. The precipitated metal may then be melted into a button.

The salt solution I use for dissolving the metal from the ore is composed of one pound of cyanide of potassium, one ounce carbonate of ammonia, one-half ounce chloride of sodium, and sixteen quarts of water, or other quantities in about the same proportions.

This solution is particularly adapted for ores containing gold, silver and copper in the form of sulphurets.

For an ore containing gold and copper only I use cyanide of potassium and carbonate of ammonia about in the proportions named.

For ores rich in silver I employ a proportionately larger quantity of chloride of sodium.

I am aware that cyanide of potassium, when used in connection with an electric current, has been used for dissolving metal, and also that zinc has been employed as a precipitant, and the use of these I do not wish to be understood as claiming, broadly.

I am also aware that carbonate of ammonia has been employed for dissolving such metals as are soluble in a solution thereof, and the use of this I do not claim; but what I do claim as new is:

The process of separating gold and silver from their ores, which consists in subjecting the ore to the action of a solution of cyanide of potassium and carbonate of ammonia, and subsequently precipitating the dissolved metal, substantially as set forth.

There are other processes all more or less intricate and involving numerous complex chemical reactions, in which ammonia and other salts and acids are employed with cyanide to extract gold from ores in the presence of copper. Among these are the leaching of the copper from the ores by means of sulphuric acid prior to the treatment by cyanide. This process is always more or less difficult, owing to the remaining copper and the acidity of the pulp, notwithstanding the washing with clear water. It always requires a greater or less amount of alkali to neutralize this acidity.

By another method, Scrymgeour's, the copper is leached out by means of a cupriforous cyanide solution, the copper being recovered electrolytically. The gold is then extracted by the ordinary cyanide solution and recovered also electrolytically.

Another method is that of leaching out the copper by means of ammonia, and subsequently, after washing, the sands are leached by cyanide solution. The copper and ammonia are recovered by distillation.

By the Bertram-Hunt method the pulp is treated by a solution of potassium cyanide and ammonia hydrate, the gold, and part of the copper, being extracted and recovered electrolytically, the gold, silver and copper present falling to the bottom as a fine precipitate or sludge, and may be treated in a filter press.

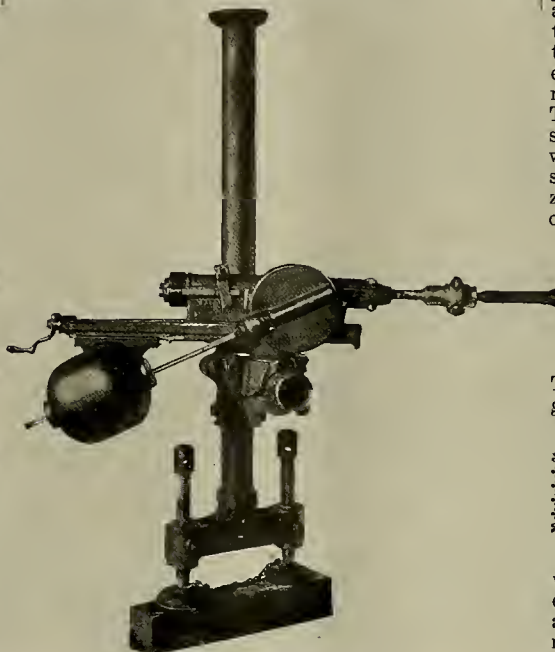
The Bagdad-Chase G. M. Co. at Camp Rochester on the Mojave desert, in San Bernardino county, Cal., have undertaken somewhat of an innovation in the treatment of its ores, which contain gold, silver and copper. The ore is an altered volcanic rock, probably rhyolite, more or less silicified and containing considerable iron oxide, copper carbonate (malachite), and silicate (chrysocolla), with gold values running \$20 to \$60 per ton and sometimes higher. Their mill is on the Santa Fe railroad at Barstow. This ore, after crushing, is treated by leaching in a strong solution of cyanide, which dissolves the gold and silver and also the copper. The gold is precipitated in the usual manner on zinc, the solution being kept strong to prevent as far as possible the precipitation of copper on the zinc. The solution, free from most of the gold, passes from the zinc precipitation boxes to a tank in which the copper is precipitated by means of zinc dust, the amount of which is care-

fully calculated and is introduced in proportion to the amount of copper present in the solution. Agitation is found necessary and is continued for several hours, until precipitation is complete.

In the treatment of the ore in the leaching tanks one pound of ammonia chloride and one pound of slacked lime are added to each ton of ore in the charge. In this process it has been found in practice that the amount of zinc dust required to precipitate the copper is from 100% to 150% of the weight of copper present in the solution, and by it the copper is almost completely recovered and the cyanide solution regenerated to a considerable extent for reuse, provided the zinc dust be free from zinc oxide.

## Electrical Rock Drill.

The Redfield all steel electrically driven rock drill, illustrated herewith, is the invention of J. H. Red-



Redfield Electric Drill.

field, 1735 Blake street, Denver, Colo. This machine is made of steel and can be operated on column and arm or tripod, and, according to the manufacturer, it requires but 1½ H. P. to operate. The motor is attached to the drill. There are but two working parts inside the machine besides the rotating mechanism. The machine proper weighs 175 pounds. The motor, which is attached to the drill and which can be readily removed, weighs 100 pounds and has 1½ stated H. P. capacity. The motor is manufactured of steel and is claimed to be water proof, and has ball bearings. This drill is being manufactured and placed on the market by Redfield Drill & Supply Co., 1735 Blake street, Denver, Colo.

## Gold Saving in Dredging.

The following is a brief extract of an article by H. L. Lewis in the London Mining Journal on recent practice in gold dredging in New Zealand:

AMALGAMATION A MISTAKE.—I found, while in Australia, a great craving among sluicing and dredging men for indiscriminate use of quicksilver. I have seen men, during the time a 6-foot box would be running its hardest, full of water and material, pour 50 pounds of quicksilver into the sluice and walk away quite satisfied, without the slightest thought or concern as to where it would go. Those who know the action of quicksilver and its peculiarities can have some idea of what became of it and any fine gold it may have picked up while on its course out at the tail of the boxes. Quicksilver, when indiscriminately used in this way, is not only wasted, but steals gold, and rolls on until finally buried in the tailings dump. It is claimed by some that quicksilver will save fine gold which would be otherwise lost. This is a matter of opinion. It certainly lessens the specific gravity and makes gold much more lively than it would otherwise be, which gives it a greater tendency to travel.

The best saver of fine gold I know of is the old perforated plate, made with slots and holes—the plate not more than 9 to 12 inches wide, with a riffle set at the back of each plate according to the fall of the box or floor. If the grade is 1 inch to the foot, make the back riffle ¾ inch deep, carry the plate over the following one sufficiently far enough to allow the sproggle set into the edge of each plate to rest on the top of the one below it, making the sproggle high enough to give ½ inch space from the bottom plate to the top one. When all the plates are set the whole becomes a series of small steps, similar to stair treads with ½-inch rises. The plates should be made of ½-inch steel or iron—steel for preference—drilled

or punched with ¼-inch holes, four to the inch. It will be found, when all plates are set, that each one is almost on a dead level, yet the fall of the floor and the grade of the run is 1 inch to the foot. The action of the system is to give to all stones and debris practically 75% of the whole sufficient fall to run away to the dump at the 8% grade—1 inch in 1 foot—while the gold, concentrates and fine sand pass through the perforations, the action of the water passing through with it keeping the fines alive without undue pressure, and the gold gravitates to the bottom, while the fine sands pass out under the space between the two plates and go through the same process over and over again, according to the length of the run. It will be found after the material has passed over the plate run very little fine gold has been lost. I have saved gold by this system that I have been unable to keep from floating on top of the water when panning off in a dish. Another advantage about the plate system is that the plates can be thrown back and concentrates taken up and placed ready for the laboratory in a few minutes. It gives the advantage of being able to clean, if necessary, the top run every evening. I have taken up 50 feet, had plates reset, and all going again in twenty-one minutes. This I claim as the best riffle of my experience for saving fine gold. Next comes expanded metal, which, laid on cocoa matting, is a most excellent gold saver, but in sluice runs must be protected by grizzlies, as the constant action of heavy stones passing over quickly wears it down. Expanded metal on dredger tables will always hold its place as a gold saver.

The gold mentioned would pass through 150 mesh. It is very unwise to cast away black sand or concentrates. I have known seemingly useless black sand and concentrates to give by fire assay 591 ounces 7 pennyweights of gold per ton. The closer we can stick to nature in gold savers the greater efficiency.

## THE PROSPECTOR.

The prospector can not afford to go into the hills with a preconceived notion. He must investigate every occurrence of mineral and test, as far as he is able, every kind of rock and formation, condemning none, for gold as well as other minerals is found in almost every kind of rock.

The mineral samples from Descanso, Cal., are of the same character—mispickel (a composition of iron, arsenic and sulphur). They may contain gold. Ore of this class is difficult to treat. It may be roasted in furnaces of proper construction to obtain the arsenic and the tailings treated for gold, if any be present, by bromo-cyanide. The gangue mineral is principally quartz. The yellow mineral is the result of the oxidation of arsenic. The ore should be assayed to learn the gold content. It may be found to be high grade enough to ship, and, on the other hand, it may be nearly or entirely without gold.

The mineral sample sent from Stockton, Cal., and marked W. D. B., is illmanite, also called menaccanite. It is titanite iron ore. It possesses the characteristic structure occurring in thin plates or laminae.

The mineral from Gilmore, Idaho, dark brown, with submetallic luster, is an impure specular iron, a variety of hematite.

The rocks from Homestead, Or., are: No. 1 is a dolomitic mineral, with scales of mariposite; rock of this character is common in some portions of the California gold belt. No. 2 is quartz, with a copper-iron mineral and a little copper sulphide; the blue color is due to azurite (copper carbonate), the brown color to iron oxide.

The rocks from Sheridan, Mont., marked D. G. D., are: No. 1 is bluish quartz, with pyrite. No. 2 is vitreous quartz stained with iron oxide; on one edge of this rock appears some red jasper.

The rock samples from Glacier Bay district, South East Alaska, marked H. M. O. are mottled marble. The texture of the marble is good, though the colors are not very bright. Possibly when developed to greater depth the quality may improve, that is be free from flaws, cracks, etc.

The rocks from Berkeley, Cal., are found to be No. 1, the blue rock glaucophane schist; No. 2, a gray schistose rock with bright shimmering plates, is talc schist in which also appears some glaucophane; No. 3 is a dolomitic mineral containing scales of the micaceous mineral known as mariposite; No. 4, the pink mineral, is largely silica.

The mineral specimens from Isabella, Cal., are: No. 1. Magnetite (magnetic iron oxide), with epidote (yellowish green mineral), quartz and feldspar. No. 2. Hornblende. No. 3. Dacite (a quartz-bearing hornblende andesite).

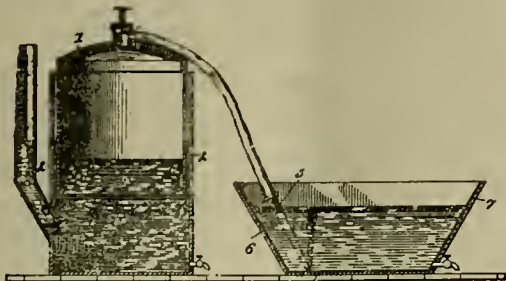


# Mining and Metallurgical Patents.

PATENTS ISSUED MAY 9, 1905.

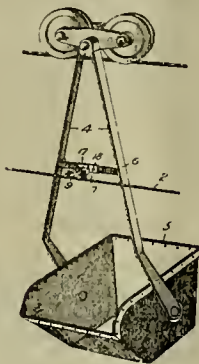
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS

PROCESS OF REDUCING METALS FROM THEIR SOLUTIONS.—No. 788,584; C. B. Jacobs, East Orange, N. J.



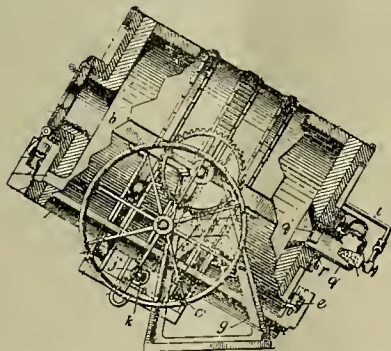
Process of separating gold from base metals, in cyanide solutions containing gold and base metal, consisting in subjecting solution to action of gaseous phosphide of hydrogen, in presence of free acid, thereby precipitating gold while retaining the base metal in solution.

BUCKET CLIP FOR AERIAL WIRE ROPE TRAMWAYS.—No. 788,674; B. C. Riblet, Spokane, Wash.



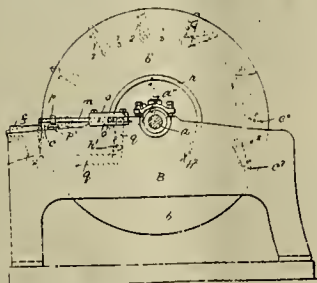
In rope and bucket clip, plate including bolts connected to plate and arranged to clamp plate to traction rope, wrist pin on plate, socket bearing having lateral opening and pivotally mounted on wrist pin, and pivotal connection between socket and tramway bucket.

COMBINED SMELTING AND REFINING FURNACE.—No. 788,546; C. C. Medbery, New York, N. Y.



Combination with heating chamber, of means for rotating, means for setting in different angular positions, fuel-supplying device connected to one end of the chamber, movable therewith and adapted to supply fuel to chamber in all of angular positions and while it is rotated; and opening at other end of cylinder.

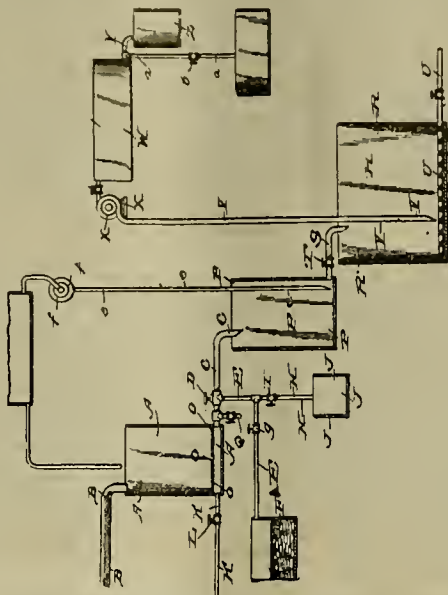
MECHANISM FOR SHARPENING ROCK DRILLS.—No. 788,919; W. P. Lightbody, Johannesburg, Transvaal.



Machine of character described comprising rotary

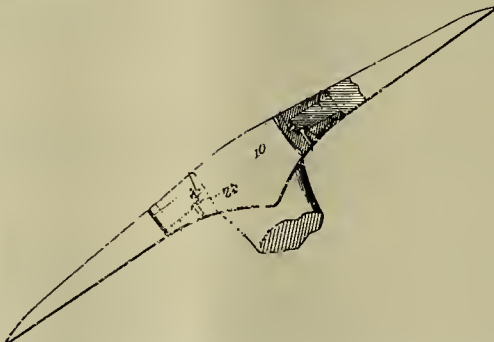
support, series of fullers mounted thereon and having successive striking surfaces arranged in relatively different positions, means for rotating support, and means for holding drill in position.

PROCESS OF EXTRACTING METALS.—No. 788,912; J. A. Just, Pulaski, N. Y.



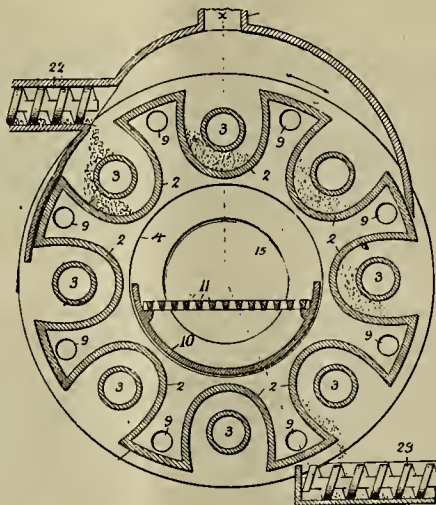
Process of extracting metals in form of metallic salts, from sulphide ores containing gold and silver, which consists in chloridizing ores, washing same to extract all water-soluble salts, adding acidified calcium-chloride solution of about 1.40 specific gravity thereto, chlorinating mass in presence of calcium-chloride solution, leaching with additional amount of calcium-chloride solution until extraction is complete, precipitating gold and silver with suitable substance, and separating precipitate from solution.

MINER'S PICK.—No. 788,719; W. W. Hoover, Penfield, Pa.



Pick comprising head having longitudinally tapered socket in one end thereof, with open-ended drift slot intersecting back of socket and extending entirely through head transversely of socket, pin permanently set transversely within head and projected into back portion of socket, and removable point having smooth tapered shank to fit socket and provided with seat to receive projection and constitute guide for proper positioning of point.

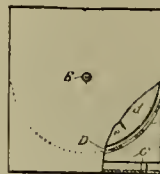
ORE ROASTER.—No. 789,371; J. W. R. Laxton, Lyon, Mass.



Ore roaster, consisting of drum revolving on horizontal axis, ore receiving pockets in periphery of drum, heat producing means within drum, hood

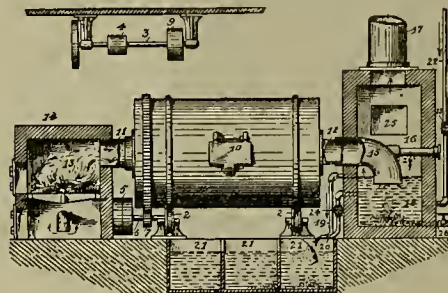
located over drum to receive fumes arising from ore being roasted, and hood located to receive products of combustion from fire within drum.

DEVICE FOR TREATING SLIMES.—No. 789,325; R. A. Kerr, Salt Lake City, Utah.



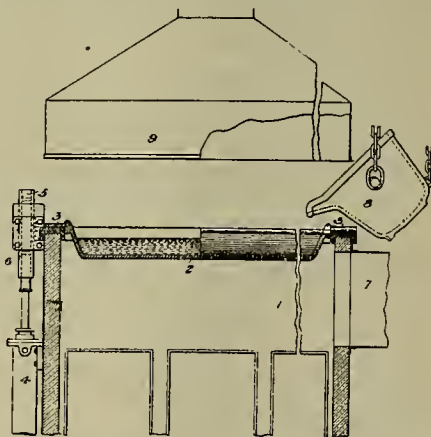
Device for treating slimes consisting in water-tight tank having inclined floor and vent at its lower part, vertical strips on sides and ends of tank, downwardly curved frame in lower part of tank, transverse strips across frame aligning with vertical strips, filtering fabric covering interior surface of all of strips, horizontal revoluble shaft extending through tank and blades on shaft adapted to rotate in curved frame.

ORE ROASTING FURNACE.—No. 789,303; P. A. Wagner, Carrville, Cal.



Combination with ore roasting apparatus, of collecting chamber interposed between roasting chamber and furnace stack, conduit for conveying hot products of combustion into collecting chamber, of means for maintaining water level within chamber above discharge end of conduit during working of ore, and pipe extending from outside of collecting chamber into discharge conduit of roasting chamber, through which pipe inspection of interior of roasting furnace may be had.

APPARATUS FOR DISTRIBUTING MOLTEN SLAG IN BLAST FURNACES.—No. 789,133; R. Baggaley, Pittsburg, Pa., and C. M. Allen, Lolo, Mont.



Blast furnace having ore charging opening and means located at different part of furnace for distributing molten charge in interior of furnace.

THE electric furnace possesses some important advantages over furnaces of ordinary type, the principal one being the very high degree of temperature which is available, making it possible to fuse substances which are infusible by any other means. It has been possible to make in the electric furnace minerals unknown in nature, for instance, carborundum. In the electric furnace mineral substances previously considered infusible are melted down without difficulty, and even volatilized.

THE new dam which it is proposed to build in the canyon of Salt river, near Phoenix, Ariz., will be a large affair. Its extreme height will be 270 feet. The overflow weir will be 210 feet above mean low water in the weir and the length of the dam at the spillway will be 780 feet. The reservoir is calculated to hold over 300,000,000 gallons of water. The dam is to cost \$1,147,000 and is to be built of rubble masonry.

"FUNNY how things go," says a San Francisco, Cal., mining engineer. "I am back from Montana drafting plans for a gold dredger to be built in Montreal for use in Colorado."



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Practically complete returns to the United States Geological Survey for 1904, as collected by E. W. Parker, statistician, show that the production of coal during 1904 amounted to 351,196,953 short tons, having a total value at the mines of \$445,643,528. Compared with 1903 this shows a falling off of 6,159,463 short tons. This decrease, although proportionately large, does not indicate any interruption to the generally prosperous conditions which have prevailed during the last eight years. It was simply a natural reaction from the abnormal activity which had been maintained throughout the coal mining regions in 1903, due to the exhaustion of all coal stocks on hand by the memorable strike of 1902. In order to renew the coal stocks and at the same time to provide fuel for immediate use, the coal mines in 1903 were pushed to their utmost capacity, or to the capacity of the railroads to handle the output. As a result the enormous production of 358,356,416 short tons was recorded. Prices raised high by the famine of 1902 remained high for a large part of the year, and the total value of coal at the mines, before any expense of transportation or selling costs had been added, amounted to \$503,724,381, an increase of \$136,600,000 over that of 1902. The production in 1904, while less than that of 1903 by 6,159,463 short tons, exhibits a normal increase when compared with the annual production during the ten preceding years. The average price for all coal mined and sold during 1904 was \$1.27, as compared with \$1.41 in 1903, and \$1.22 in 1902. The statistics for the production of anthracite in Pennsylvania, which are complete, show that the output in 1904 amounted to 65,318,490 long tons (equivalent to 73,156,709 short tons), valued, at the mines, at \$138,974,020, as compared with 66,613,454 long tons (or 74,607,068 short tons), valued at \$152,036,448 in 1903. The decrease in production in 1904 therefore amounted to 1,294,964 long tons (or 1,450,359 short tons), while the falling off in gross revenue amounted to \$13,062,428. Of the total production of Pennsylvania anthracite in 1904, 57,727,178 long tons were shipped to market, 1,410,703 tons were sold to local trade and employees, and 6,180,609 tons were used at the mines for steam and heat. The average price for the marketed product (excluding colliery consumption) in 1904 was \$2.35, as against \$2.50 in 1903. One of the interesting features in connection with the anthracite trade is the constantly decreasing proportions of the large or more profitable sizes of coal sent to market, and the equally constant increase in the proportions of small or less profitable coal. In 1890, 77% of the shipments from the anthracite regions consisted of sizes larger than pea coal, and 23% represented the shipments of pea coal and smaller. In 1904 the large sizes made up only 62% of the total, while the small sizes had increased to 38%. Or, putting it in another way, the total tonnage of large sizes from 1890 to 1904 has increased 25% (from 28,154,678 tons to 35,636,661 tons), while the tonnage of small sizes has increased 158% (from 8,460,781 long tons in 1890 to 21,855,861 long tons in 1904). The recovery of usable coal from the old culm banks by washing has furnished some of this increase in the shipments of small sizes, and the installation of washeries at the breakers for saving the small sizes in the primary preparation of the coal has done more. The recovery from the old culm banks has averaged about 2,500,000 long tons annually during the last four years. The statistics of bituminous coal production comprise all varieties except Pennsylvania anthracite, and include semianthracites, semibituminous, cannel, splint, and block coals, and brown and black lignites. The small production of anthracite in Colorado and New Mexico is also included in the bituminous output. In 1904 the aggregate production of all these varieties amounted to 278,040,244 short tons, valued at \$306,669,508, against 282,749,348 short tons, worth \$351,687,933 in 1903, indicating a decrease of 4,709,104 tons in amount and \$45,018,425 in value. The average price a ton for all coal mined and sold, including colliery consumption, fell from \$1.24 in 1903 to \$1.10 in 1904.

The following table shows the amount and value of the coal production of the United States in 1904:

State.	Production.	Value.
Alabama	11,168,194	\$13,356,065
Arkansas	2,009,451	3,102,660
California and Alaska	75,838	207,261
Colorado	6,594,295	9,604,228
Georgia and North Carolina	400,191	489,596
Idaho	3,380	12,330
Illinois	35,990,796	39,417,882
Indiana	10,929,908	12,068,097
Indian Territory	3,011,972	5,472,490
Iowa	8,542,005	10,555,169
Kansas	6,322,875	9,621,252
Kentucky	7,559,940	7,848,153
Maryland	4,816,171	5,723,774
Michigan	1,338,447	2,410,358
Missouri	4,187,197	6,872,126
Montana	2,197,408	2,197,408
Nevada	150	1,500
New Mexico	1,459,182	1,908,952
North Dakota	269,297	381,731
Ohio	24,415,054	26,522,090
Oregon	111,540	243,588
Pennsylvania	97,916,733	95,877,581
Tennessee	4,782,302	5,642,558
Texas	1,072,195	1,750,355
Utah	1,591,607	1,941,395
Virginia	3,578,002	3,087,232
Washington	3,135,757	6,115,863
West Virginia	82,332,385	28,818,698
Wyoming	5,177,351	8,741,970
Total bituminous	278,040,244	\$306,669,508
Pennsylvania anthracite	73,156,709	138,974,020
Grand total	351,196,953	\$445,643,528

### ALASKA.

J. K. Darnell of Breckenridge, Colo., writes to the Breckenridge Bulletin from Fairbanks, Alaska, that the ground is always frozen and that they sink from 12 to 150 feet to bedrock without a stick of timber, as it never thaws. The gravel that pays is from 2 to 10 feet on bedrock and is thawed out in the working shafts with steam from boilers which run engines and hoists. The ground is thawed by using points, which are pointed and hollow from near the butt to the point and are about the size of a drill. This point is driven into the frozen ground and steam forced through the hollow part. Wages are \$6 per day for teamsters and all expenses; but freighting is mostly done in the winter when the ground is frozen, as the top soil or muck which lies above the ground from 10 to 40 feet thick will thaw 3 or 4 feet deep. Board is \$80 per month in town and at the mines \$28 per week with lodging, and wages \$1 per hour. Freight to the mines, 25 miles away, is 5 cents per pound.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The successful run of the new 5-stamp mill of the Gold Nugget M. Co., near Bisbee, has caused the company to decide to add new stamps and concentrators. Two new hoists are also to be added. Work has been started at the Denn-Arizona at Bisbee. In Warren district the Saginaw, near Bisbee, is down 875 feet and work is progressing at the rate of 65 feet per month. A drift is being run on the 350 toward the old incline shaft to make an air connection. A double drum first motion hoist has been ordered. It will have a capacity to handle a load of 7500 pounds at a depth of 1400 feet. At the Shattuck & Arizona, at Bisbee, the drift on the 500 is in 130 feet. The shaft is down 665 feet. Water in the shaft continues to increase slowly and is making at the rate of 2000 gallons daily. The company employs twenty-six men. Bisbee, May 16.

#### Graham County.

(Special Correspondence).—The Coronado Copper Co. is putting in a new 25 H. P. gasoline hoist at shaft No. 2. The small hoist at present in use will be moved to another place where the work is lighter. J. S. Schofield is superintendent. Metcalf, May 15.

#### Mohave County.

J. Brockman, manager of the Commonwealth M. Co., operating the Pilgrim mine at Pyramid, 20 miles from Kingman, is crosscutting from the bottom of the 200-foot shaft and intends to continue sinking to a depth of 500 feet.

#### Pinal County.

(Special Correspondence).—In Kelvin, or Mineral creek, district the Big Lead M. & S. Co. is making a test run of 500 tons of copper ore in the Boh Tail mill, which the company has leased. It has also ordered a 100-ton concentrating plant and expects to buy the mill and begin active operations. Kelvin, May 15.

#### Yavapai County.

(Special Correspondence).—A new placer machine being put in by the International M. Co. on their claims on Lynx creek is said to handle 1000 tons of dirt daily, which is pulverized by a separate machine. It is forced by air through a series of screens. The gold, being heavier, drops into receptacles. Prescott, May 16.

On the Santa Maria river, west of Hillside, J. H. Hise has started a 900-foot tunnel to develop his vein near the Sultan mine. Work has been started on the Venture Hill and Black Hills group, near Jerome. Superintendent Davies of the Reliance Co., working the Sundance in the Hassayampa district, south of Prescott, is shipping concentrates regularly. It is expected that the sampling works of the new smelter at Val Verde will be running by Aug. 1. The machinery for the 600-ton smelter has been ordered. The main shaft of the Great Reliance mine, near Turkey, is down 540 feet.

It is reported that Manager C. W. Clark will put in a new 500-ton furnace and two copper converters at the United Verde smelter at Jerome. Smelter Superintendent Taylor has been making experiments with oil in smelting. The Decatur at Jerome has been unwatered and drifting commenced.

#### Yuma County.

The Arizona Sampling & Smelting Co. has been formed to establish an ore sampling plant in Yuma. The company expects to be ready to receive ore by July 1.

### CALIFORNIA.

It is reported that a war is waging between the Standard and Associated Oil companies and the Union Oil Co. for control of California oil. As a result of this condition the independent owners are said to be suffering. It is said that the Standard has formed a compact to squeeze out the smaller dealers and have been exchanging oil in Los Angeles and San Francisco, loading Associated oil and shipping from Los Angeles, while the Associated is loading from Standard tanks. They are selling as cheap, if not cheaper, than the actual cost of production. In the Coalinga oil field, although the Associated is paying 15 cents for crude oil, it is selling to local consumers for 65 cents a barrel.

#### El Dorado County.

Work at the Alcimonte mine, formerly the Granite, has been temporarily suspended pending the arrival of a new hoist. Operations will be resumed under the supervision of Chas. Henson.

The Oro Flamme mine, Diamond district, has resumed work. It is reported that a very rich body of ore has been encountered at the Pyramid mine, near Shingle Springs. It is reported that a heavier engine and new machinery it to be put in the Ida Mitchell mine, Placerville, and the shaft put down to the 1000-foot level. Work at the Granite mine, Smith's Flat district, is under the foremanship of C. Hanson. The new hoist is being put in.

#### Kern County.

The Gold King mine, Randsburg, is being developed

by H. W. Manly of Johannesburg. The shaft is down 80 feet.

#### Nevada County.

New hoisting machinery is to be put in at the Kenosha mine, Grass Valley, preparatory to deepening the shaft. New electric pumps are to be put in at the Bullion mine, near Grass Valley, to handle the heavy flow of water recently struck. The Union reports that the North Star M. Co. employs 384 men, the Empire 175, Pennsylvania 120, Sultana 55, Brunswick 50, New York-Grass Valley 37, and Idaho-Maryland 30.

J. McElvey of Oakland is opening up the Birchville and South Fork mines, near Graniteville.

#### San Joaquin County.

(Special Correspondence).—A. P. Bovier has returned from the general managership of the Oriental mines, Korea, and with G. W. Kimble is testing some property here with a view of putting in a gold dredger. Clements, May 18.

#### Sierra County.

F. Kuhfield has charge of work on the South Eureka mine, near Forest City, which is under bond to J. H. Hurin and E. G. Gardiner, both of Los Angeles. W. W. Tiner, superintendent of the Alleghany M. Co. at Balsam Flat, near Alleghany, has run the tunnel in 900 feet and is working on the second upraise to find the bottom of the channel, the first having struck the east rim. He has negotiated with New York people to bond the Young America mine, ½ mile southwest of Forest City. O. Owens has driven the tunnel of the Columbia Channel G. M. Co., near Forest City, over 1600 feet and hopes to strike the channel within 200 feet. J. M. Harper is manager. H. L. Johnson continues to take high-grade ore from the Tighter at Alleghany.

#### Siskiyou County.

It is reported that the New York mine near Fort Jones has been shut down. J. B. Scott, the superintendent, is in St. Paul, Minn.

#### Trinity County.

R. Hicks of Junction City has seven men working at the Hunter mine at New River City. J. Byers is working the Mountain Boomer, owned by the Bob's Farm M. Co., at New River.

#### Tuolumne County.

Excavations for mill foundations are being continued at the Horse Shoe Bend mine, near Columbia. Ore is being taken from the 90-foot shaft. At the Jumper mine twenty stamps are dropping. Superintendent M. D. Kelley is devoting his attention to development work. It is reported that Superintendent W. R. Hall, of the Bluebell M. Co., will start milling the ore from the Hardtimes mine at Arastaville.

### COLORADO.

(Special Correspondence).—The Colorado State Mine Operators' Association, with headquarters in Denver, realizing the importance of having a Bureau of Mines and Mining in the President's Cabinet at Washington, will work in harmony with similar organizations in other States. The association when first organized was made up of delegates or members from local associations throughout the State. On account of some of the mining districts not being in a position to support a local organization the State association has decided to do away with the original plan and make it a stronger and larger organization. W. E. Passmore, secretary of the association, says that the association has never and does not intend to use its influence in the political field. It is believed that when the operators throughout the State come to understand the needs and objects of the association they will not hesitate to become members and that within a short time a large majority of the operators will affiliate with the organization. "High grading" is still being carried on systematically in certain districts of Colorado. The question is attracting the attention of the operators and an attempt will be made to do away with the stealing. The card system which is now employed in several districts is said to be about the best remedy known. When a person is caught high grading his card is taken up and he is not permitted to work in the district in any of the mines without a card from the operators and in that manner the operators believe they have solved, to a certain extent, the high grading question. Decisions have been rendered that a person knocking down ore and catching it before it drops to the ground can not be considered as stealing as it is impossible to steal real estate. Should the ore drop to the ground or be taken from the ore bin it is considered stealing, but the question has been to prove the ore. The Telluride mill which was advertised for sale by Duncan Chisholm, trustee of the defunct General Metals Co., Colorado Springs, was not sold, as no bids were made, owing to the statement of the trustee that no bid would be received or considered for less than \$200,000. It is understood the same will be re-advertised for sale. The probability of the Burlington and Union Pacific roads making lower freight rates from Denver into Wyoming and the Black Hills is encouraging the manufacturers of mining machinery in Denver. Denver, May 16.

In a recent paper of the U. S. Geological Survey, N. H. Dalton says that "lignite coal occurs in the sandstone series that outcrop near the base of the Laramie formation along the foothills of the Front Range in a belt extending from near Greeley, 50 miles north of Denver, to Wildcat mountain, 25 miles south of Denver, and appears again after an interval of 50 miles near Colorado Springs. South there is coal in the northern portion of the Raton coal field in the Walsenburg-Trinidad region. Coal occurs in the Denver region 200 feet above the base of the Laramie formation in beds that are steeply inclined near the base of the mountains, but lie nearly level under the plains. At Scranton, 20 miles east of Denver, coal occurs in clays of the upper Laramie. The steeply inclined coals to a depth of 300 feet have a relatively higher specific gravity, but a lower fuel ratio than the prairie coals which resemble the bituminous coals of the East. The coal at Scranton in the upper Laramie is a true lignite with a high water content and a low fuel ratio. From Ralston southward the Laramie formation dips steeply at angles from 70° to



80°, and the outcrops of the coal-bearing portion of the series lie in a narrow band 250 feet wide. North of Ralston and east of Boulder the dip becomes more gentle and a succession of faults and folds brings the coal within profitable working distance over a large area. The coal is black, lustrous and breaks in blocks. The beds have a thickness of from 4 to 10 feet. The Scranton mine shaft shows two workable beds of coal, 6 feet and 7 feet thick, respectively, separated by 1½ feet of shale and sandstone, containing a 3-foot bed of coal. The Walsenburg-Trinidad region is the northern extension of the Raton field of New Mexico. The coal is found in the sandstone series at the base of the Laramie formation. Toward the south of this field in Colorado the coal is much changed or even destroyed by igneous intrusions. The excellent coking qualities of the coal in this region is thought to be due to these igneous intrusions. Near Walsenburg and Pitcon only the basal coals of the Laramie are worked."

King & Craig are successfully operating a cyanide plant on the Anaconda property at Cripple Creek. Besides treating the dumps of Gold hill, they are mining ore from the main Anaconda vein near the surface. The winze being sunk below the 400-foot level has reached a depth of 160 feet, which gives a total depth of 547 feet. Machinery has been put in the underground workings to handle the rock economically.—A lease has been granted upon the property of the Rattler G. M. Co. on Raven hill to J. Bussert of Cripple Creek and S. S. Childs. The lease is for two years and provides for the sinking of the main shaft to a depth of 500 feet. The lessees are putting in hoisting machinery and power drills.—The south block of the Agnes property on Beacon hill, Cripple Creek, has been leased to S. B. Inskeep. He proposes to sink 50 feet, giving a depth of 200 feet.—P. J. Fleming, leasing the north block of the Agnes, intends to put in a hoist and develop mineral indications at the 100-foot level.—F. Wilder and associates will resume work at the Fountain Valley shaft of the Banner Gold Co.

#### Boulder County.

The Summit mine, ½ mile above Salina, is to be worked soon. Nearby, the Fairfax, Clansie tunnel, Richmond and Ingram have been shipping.

#### Chaffee County.

Temporary suspension of operations at the Mattie C. mine, 7 miles north of Buena Vista, has been caused by a breakdown of pumping machinery at the mine, and twenty-five men have been laid off. The mine will be shut down until the repairs can be made.

#### Clear Creek County

W. Teagarden, manager of the St. Paul M. Co., has sold a controlling interest in the property to C. W. Miller of Osage City, Kan. The St. Paul vein is an extension of the Colorado Central on Green Lake mountain, near Georgetown, and is being developed by tunnel. The upper level is in over 1500 feet. Machinery will be put in at the base of the mountain to drive crosscut tunnel started recently.—The Pay Rock power plant, near Breckenridge, has been started and power drills are being used in the upper Pay Rock tunnel, being driven by C. I. Burt, who is endeavoring to cut the Vulcan lode at a depth of 300 feet under the old workings.

#### Gilpin County.

The Jo He tunnel, in Phoenix district near the mouth of Boulder park, has been started up under the foremanship of D. D. Johnson.—G. Mosch of Tolland has a contract for extending the Gold Run tunnel property, near the head of South Boulder creek. The main tunnel, which is a crosscut, is in 305 feet and the tunnel is to be extended several hundred feet.

#### Gunnison County.

The Southwestern smelting plant, 2 miles below Whitepine, has been leased and will be run by McArthur & Co. of Leadville. The plant is of fifty tons capacity. The mines of the district have ore in sight to keep the smelter running steadily.—The Raymond tunnel at Ohio City is in 2150 feet, has a vertical depth of 1260 feet and in this distance has cut fourteen veins, six of which are being developed. It is reported that a mill will be put up this season.—The West Gold Hill M. Co. is operating its 50-ton mill in West Willow Creek gulch, in the Tin Cup district.

#### Lake County.

Lead carbonate ore is being opened up at the Bessie Wilgus mine, Leadville.—A new shaft is to be sunk on the Buckeye, Fryer hill, Leadville, by Lessees Jenks & Finn.

G. H. Harlan will start work at his Mt. Elbert mine near Twin Lakes.—H. Hentschell is preparing to resume work at the Mt. Storm, Twin Lake district.—Work has been commenced at the Cache Creek placers by Manager N. A. Loggin of Twin Lakes.

#### Ouray County.

As soon as the damage done by the snowslide at the Bankers' Cons. mine, above Ouray, is repaired, work will be started on the crosscut tunnel, which is in 1265 feet. Considerable surface prospecting will also be done. J. McNeill is superintendent.

#### San Juan County.

The Silverton Standard says that four new tram lines are to be constructed in San Juan county this year. The Mogul will be 2½ miles long and the Gold Prince tram will be 10,000 feet. The Ross M. Co. are figuring on placing a line at their Galty Boy property, Cement creek, and Champion mines, Sultan mountain, while the Mayflower Co., as a possible fifth, contemplate connecting their mine with either the Contention mill, on the Animas river, or with a plant that will be built this summer. When completed these will make 21 miles of aerial tramway in the county.

#### Summit County.

C. Senter, superintendent of the Golden Clover Leaf Co., has resumed work on Fletcher mountain, near Breckenridge.—The Felicia Grace M. Co. of Breckenridge is enlarging its shaft and intends sinking to the second ore body.—The Jennie Queen Co. are pumping and sinking.—Preparations are being made to sink the Robinson Con. east shaft, near Breckenridge, 225 feet deeper.—The King Solomon M. D. & T. Co. of Frisco are putting in a new air compressor to hasten work on

the main tunnel. D. Myers is superintendent.—The Excelsior mine at Frisco is reported closed because of too much water.—Electric power is to be put in at the Admiral G. M. Co.'s mine, near Frisco.

#### Teller County.

The Golden Cycle Co. is preparing to build a 200-ton mill for the treatment of ores from its Cripple Creek mine.—The Regi group on Battle mountain, Cripple Creek, has been bonded for \$250,000, the bond and lease being in the possession of the Fortuna G. M. & L. Co., C. S. Kinney, president. They will extend the 200-foot level to cut an extension of the Portland vein.

Ore is being shipped from the Triumph mine on Battle mountain, Cripple Creek. This is being taken out through the main shaft of the Coriolanus. A crosscut is to be started from the 500-foot level of the Coriolanus to prospect the Triumph ground.—At a depth of 185 feet the 250-foot shaft being sunk by the lessee, C. G. Jackson & Co., on the Black Jack of the Anchor G. M. Co., has struck a good ore body.—Lessees Selbach, Johnson and associates, operating on the Pride of Cripple Creek on Ironclad hill, have ordered a new 80 H. P. boiler, an 8x10 hoist, and a 6-drill compressor. The shaft is down 150 feet and will be sunk to the 300-foot level before lateral work will be started.—The Clyde M. & M. Co. has granted to the Majestic Finance & Development Co. a bond and lease on its Bull Hill property. C. P. Schumacher has charge.—F. J. Buck has a contract to sink from 300 to 600-foot level of the Nugget shaft on Rosebud hill, Cripple Creek, under lease to the Kimball Investment Co. of Denver.—The Conundrum claim of the Anchoria-Leland Co., the Mary Ann claim of the Duchess Co. and the Ethel Louise claims Nos. 1 and 2 have been consolidated as the Ethel Louise G. M. Co. The claims are on the west slope of Gold hill, Cripple Creek. The deal has prevented litigation. The properties are traversed by the Conundrum vein and will be worked through the Conundrum shaft, now 800 feet deep. C. W. Howbert is general manager.

#### IDAHO.

##### Boise County.

(Special Correspondence).—A new mill is to be put in at the Osborne mine at Marsh. C. A. Devlan is manager at the mine.

Marsh, May 15.

##### Cassia County.

The Idaho Oil, Gas & M. Co. has been formed to prospect and operate oil and gas wells and coal mines in Goose Creek canyon, near Oakley. H. G. Carpenter of Pittsburg, Pa., will put in a boring machine with a 3300-foot capacity.

##### Idaho County.

The 40-stamp mill of the Sunnyside mine at Roosevelt has been started again.

##### Shoshone County.

The Success M. Co. has fifteen men at work grading for their new 100-ton mill and concentrator near Wallace, which they expect to have running by August 1. This will handle ore from the Granite property on Nine Mile creek and will save both zinc and lead concentrates.—Experiments have been made toward dredging Pritchard creek near Wallace.—The Handspike copper mine on Little North Fork continues to show good copper.—The Stewart mine near Wardner has resumed shipping carbonate ore carrying good values in lead and silver.—The New Jersey G. M. Co.'s flume on Big creek near Wardner, a part of which was carried away by a landslide, is being replaced.

Condemnation proceedings have been instituted in the Wallace district court by P. Larsen and T. L. Greenough, owners of the Morning mine at Mullan, against A. A. Headrick and C. M. Baillie. A tunnel, known as the Morning tunnel No. 6, is being driven by Larsen & Greenough. It has already proceeded 7605 feet, and it is the intention to continue driving it 1080 feet farther. By this tunnel the mine can be worked and developed to a depth of 2500 feet. Between the ore bodies and the mouth of the long tunnel are two claims owned by Headrick & Baillie, which are known as the Blackhawk and the Alvy claims. The complaint says it is necessary for the long tunnel to traverse these claims for 694 feet, at a depth varying from 1750 to 1900 feet, in order to reach the ore bodies. It is recited that the only successful and complete way to work the mine and drain it is by means of this long tunnel traversing the Blackhawk and Alvy claims. The plaintiffs allege that they have endeavored to acquire a right of way for the tunnel through the claims by agreement or otherwise and have been unsuccessful. A decree is asked from the court, condemning and awarding the plaintiffs a right of way through the two claims. They ask that three disinterested persons from Shoshone county be appointed to act as commissioners, who will assess any damage that may result. They desire to appropriate a space 10 feet wide, 12 feet high and 694 feet long. It is asserted in the complaint that no damage to the claims can possibly result, but that, on the contrary, they will be benefited. Headrick & Baillie recently instituted proceedings in the district court seeking to restrain Larsen & Greenough from continuing with the long tunnel. They later dismissed the action and transferred the case to the Federal court.

A dredger is being built on French gulch, near Pierce City, with a reported capacity of 400 cubic yards daily.

#### MICHIGAN.

(Special Correspondence).—Production by Lake Superior copper mines fell off in April, owing to the strikes which enforced suspension of operations at the Wolverine, Franklin and North and South Kearsage branches of the Osceola Con. mine. The total production of the district was 16,800,000 pounds of refined copper.—The Copper Range Con. Co. has a two-years' option on two sections of the Glohe property, on the south range, owned by John Stanton of New York. A vertical shaft will be sunk through the sand and boulders overlying the ledge, and crosscuts will be run in both directions from the bottom to cut the Baltic lode.—The Atlantic mine is stamping 950 tons of rock daily.—Preparations are being made for a compound stamp head at the Calumet & Hecla M. Co.'s stamp

mills at Lake Linden for experimental purposes. The Calumet & Hecla will put in two compound heads.—The Phoenix Con. Co. of Keweenaw county will prospect the Ashbed lode and the St. Clair fissure vein.—Surveys have been completed for a new shaft for the Rhode Island property.

Calumet, May 15.

#### MONTANA.

##### Fergus County.

The Judith Belle G. M. Co., near Gilt Edge, will start prospecting with diamond drill. — E. W. King is putting in an electric drill plant at the Barnes-King mine at Kendal.

##### Madison County.

The Revenue mill, near Norris, has resumed operations after being closed for two months. — The Montana & St. Paul M. Co. has reorganized as the Montana Overland M. Co. and will develop claims in the Wisconsin creek district, east of Twin Bridges. — The gravel in Goodrich gulch, 7 miles from Twin Bridges, is to be hydraulicked by the American Goldfields Co. of Spokane, Wash.

##### Silver Bow County.

(Special Correspondence).—The copper output of the Butte district for the thirty days ending May 13 was 34,400,000 pounds, the different companies being represented as follows: Anaconda, Parrot, Butte & Boston, Trenton and Washoe (Amalgamated), 18,150,000 pounds; Boston & Montana (Amalgamated), 5,850,000 pounds; United Copper, 3,900,000 pounds; Clark mines, 3,580,000 pounds; North Butte, 1,920,000 pounds. For two weeks the Parrot has been shut down by injunction, on which account there has been a loss from that source of 35,000 pounds a day. Reports from New York, from United Copper sources, are that negotiations for a settlement in the Montana war between the Amalgamated and F. A. Heinze have been renewed.—A strike of copper has been made in the Belmont (United Copper) mine, on which Heinze has been doing development work.—The average of Amalgamated ore yields sixty-five pounds of copper to the ton. North Butte shows an average of eighty pounds.—A rich strike of gold has been made in the Carbonate district near Monarch, Cascade county, on the claims of H. E. Randall.

Butte, May 15.

C. L. Geyman of Butte, president of the Geyman M. Co., has been sentenced to forty days in the county jail of Silver Bow county for violation of a restraining order issued by Judge H. Knowles in April, 1904. The case in which the sentence was imposed is that of the Butte & Boston M. Co. against the Geyman M. Co. and C. L. Geyman, the property in dispute being the Kane No. 1 vein. Judge Knowles issued an order restraining the defendants from extracting ores from this property. Some time ago application was made by the plaintiffs for an order citing the defendants to show cause why they should not be punished for contempt of court for violation of Judge Knowles' order. Judge Hunt issued the order to show cause and the defendant was found guilty. The Geyman M. Co. was also adjudged in contempt and fined the cost of the proceedings.

#### NEVADA.

##### Esmeralda County.

Superintendent E. A. Colling has started the 10-stamp mill of the Combination M. Co. at Goldfield, using water piped from Alkali Springs, 10 miles northwest of Goldfield. They are milling ore from the Combination and the January.

##### Lincoln County.

The Irish Mountain district, 10 miles from Hiko and 50 miles from Caliente, is attracting attention. L. F. Peer, manager of the Illinois property, reports that the county will pay for repairing the road between camp and Hiko.—T. Hatfield, Vickery, Pike & Smith, W. J. Lawrence and G. Wilson are working different properties in the district.

##### Nye County.

The Silverbow mining district has been formed, 50 miles east of Tonopah and 45 miles northeast of Goldfield. Water and wood are said to be plentiful and a number of prospects are being developed.

#### NEW MEXICO.

##### Grant County.

It is reported that work is to be resumed on the Wild Cat mine, at Santa Rita, which has been closed because of litigation.—C. P. Crawford and R. Worthing are putting in a concentrating plant to treat the dumps around the Chino mine, near Santa Rita.—C. A. Stevens is developing claims at Chloride Flat, near Silver City.

#### OREGON.

##### Baker County.

A 10-stamp mill is to be put up at the Queen of the West mine, in the Cornucopia district.—It is reported that a mill will be built at the Mayflower, near Cornucopia.

Placers are suffering from want of water in many sections of eastern Oregon. Especially is this the case on the smaller streams, where placer mine owners have been waiting for a heavier flow of water than has occurred so far this season. Many have already given up the idea of trying to do anything this season and will wait for better conditions next year. Along the larger streams much work is being done, as miners are not so handicapped by shortage.

A rich strike is reported in the Platts' group, Rock Creek district, possibly on an extension of the Cracker Creek lode. H. T. Hendryx of Sumpter is manager.

##### Douglas County.

Director of the Geological Survey C. D. Walcott has informed the mine owners of the South Myrtle Creek district that the samples of black sand sent to him from their properties contain platinum in paying quantities. A. M. Armitage, who is superintending the Yellow Jewel work on South Myrtle creek, sent the first samples.

##### Grant County.

The dredger at the Crane Flat mine, near Grant, has been started by Burch & Burbridge of Spokane, Wash.



**Jackson County.**

The Sterling mine has been sold by H. E. Ankeny and V. Cook to F. J. Blakely and the Sterling Mine Co. J. D. Heard will be manager.

**Josephine County.**

It is reported that the Takilma smelter is to be blown in on June 1, or as soon as the roads dry up sufficiently. The smelter has a capacity of five tons of matte per day.

The Improved S. & M. Co. of Portland has completed plans for a 50-ton custom smelter in Grant's Pass. J. V. Snowgoose is manager.—J. MacCann of Medford has a bond on W. Febeley's property on Upper Sucker creek.

Superintendent W. I. Fleck of the Lewis & Clarke property, near Grants Pass, intends to put in a small compressor, to be run by water power.

**Lane County.**

(Special Correspondence).—G. Bohlman, who owns five claims in Bohemia, has good returns on assays.—The Champion Basin M. Co. are making preparations to begin work.—W. H. Shane will commence a tunnel on the Pittsburg property at Bohemia.—A. B. Wood, manager of the Oregon Securities property at Bohemia, states that the machinery at this big plant is working well. Twenty of the thirty stamps are dropping. Cottage Grove, May 16.

**SOUTH DAKOTA.****Lawrence County.**

The Imperial M. Co. has completed an addition to its cyanide plant in Deadwood, which will make it possible to treat 4500 tons of ore monthly. The company has nearly completed the payments on the McGovern ground, at Bald mountain. The company is crushing a little coarser than formerly and is allowing a longer time for leaching.—The Richmond-Sitting Bull M. Co. has been organized in New York City to build a cyanide plant to work the low-grade silver ores found in the Sitting Bull and Richmond mines at Galena.

**UTAH.****Juab County.**

Work has been resumed at the Mammoth mine at Eureka.—Ore shipments from Tintic for the week ending May 15 were: Eagle & Blue Bell, 7 carloads; Yankee Con., 4; Bullion-Beck, 8; Gemini, 7; Ajax, 2; Carisa, 2; Grand Central, 4; Mammoth, 1; Victoria, 6; Star Con., 3; May Day, 6; Uncle Sam, 2; Centennial Eureka, 92; Swansea, 1; total, 145 carloads.

**Salt Lake County.**

It is reported that E. A. Wall will enlarge the Amanda tunnel of the Starless group at Bingham and put in an air compressor and power drills. It is stated that the Amanda tunnel has cut the copper-bearing porphyry.—A new air compressor and hoist are being put in at the Butler-Liberal at Bingham.—The name of the Red Wing Extension Co. at Bingham has been changed to Massasoit. Manager McCarrick of the Massasoit is working four men and is drifting from the shaft at a depth of 425 feet, where there is a good showing of galena ore, with some copper.

**Summit County.**

It is reported that work is to be resumed at the Silver King Con. as soon as the Ontario No. 2 hoist can be moved to the Silver King. The shaft is down 800 feet. A new compressor is to be put in. J. McGivern will have charge of work. S. Spiro is manager.

**Utah County.**

The mill of the Utah Ozokerite Co. at Colton has been started on ore from the dump.

**WYOMING.****Natrona County.**

The Cole Creek M. Co., operating the Muddy mines between Douglas and Caspar, is putting in a new hoist, dynamo and boilers. M. E. Kennedy is superintendent.

**FOREIGN.****AFRICA.**

It is reported that the Rand gold industry has reached, so far as output is concerned, the position that it held previous to the Boer war. Recent improvements have been tube mills, power gas plants, and the more extended use of slime plants. It is estimated that the use of tube mills will give a 5% higher extraction at a cost of about half of the value of the extra gold obtained with the high-grade mines. At Cinderella Deep, a power gas plant is being built in expectation of reducing the fuel bill. Many mines are short of native labor and others employing Chinese have not yet had time to bring them to the full degree of efficiency. The miners claim that it is unfair that the mining companies should be compelled to pay a minimum rate of wages of 1 shilling a day, which is increased to 50 shillings a month after the first six months. Under the existing arrangement a Chinese coolie, the mining operators say, can do as small an amount of work as he sees fit, and the company by which he is employed must pay him his stipulated wage whether he has earned it or not. At the Van Ryn, which received one of the earliest batches of Chinese, the working costs have fallen during the past twelve months from 25 shillings 7 pence to 18 shillings 11 pence per ton milled. The reduction is probably mainly due to the increased rate of working, but nevertheless goes to prove that the cost of Chinese labor will not be greatly different from the cost of Kaffir labor.

**CANADA.****BRITISH COLUMBIA.****Boundary District.**

W. S. Macey has men working the Tip Top at Skylock.—M. Bellefontaine and M. McDonnell have struck a good vein of free ore on the Buttercup, 2 miles east of Eholt.

The Hartford group at Hartford Junction, owned by

the Hartford G. M. Co., in which S. H. C. Miner is interested, is to be worked after being idle for five years.

**Cariboo District.**

S. Keast has started boring at Wingdam, Lightning creek, to determine the best method of working the ground. Ashcroft is the nearest railway point.—The Sil-Why-A-Kin Mountain M. Co. has been formed to work the Clearwater mica mines, 60 miles northeast of Quesnell Forks. A. J. Colquhoun is manager and engineer.

**East Kootenay District.**

G. O'Brien, a fire boss at Coal creek, was recently fined \$10 for firing a shot with a naked light.

On May 20 the Sullivan M. Co.'s smelter at Marysville is to be blown in. Crushing in the mill has been going on for some time, and the two mechanical roasters, with a capacity of forty tons per day each, have been started. The Sullivan M. Co. has resumed work at its mine 3 miles from Kimberley. There was a temporary shutdown while an addition was made to the crusher buildings at the smelter. Active work has been resumed at the Dominion group, which expects to ship ore to the smelter after the blowing in.

W. Haupt of Wilmer has started work on the Tecumseh mine at the head of McDonald creek in the Windermere district.

**Nelson District.**

J. N. Scott intends putting in a power drill and 5-stamp mill at the Dundee M. Co.'s property, 6 miles from Nelson.

**Rossland District.**

The Le Roi concentrator has been given a test run in part. Superintendent Mitchell has been putting through the mill small lots of second-class ore, and he says this concentrator will solve the problem of successfully concentrating them. Following are the shipments for the week ending May 13: Le Roi, 2050 tons; Center Star, 1500; War Eagle, 1500; Le Roi No. 2, 90; Le Roi No. 2 (milled), 600; White Bear (milled), 300; Jumbo, 200; Spitzee, 60. Total for the week, 6300; for the year, 128,114 tons.—Following are the figures of the payrolls in detail for April: Le Roi, \$21,000; Center Star, \$19,400; War Eagle, \$12,260; Le Roi No. 2, \$7843; Spitzee, \$2000; Jumbo, \$2000; White Bear, \$2000; smaller mines and properties, \$5000; staffs of mines and mills, \$10,000. Total for mines, \$81,503. The smelters—Trail, \$35,000; Northport, \$11,000. Total for smelters, \$46,000.

**JAPAN.**

C. J. Davidson, in a recent board of trade report, says that the Besshi copper mine is in the Ehime prefecture, in the province of Iyo, to the northwest of the island of Shikoku, one of the four main islands of which Japan is composed. The whole range of mountains in which Besshi is situated is composed of metamorphic crystalline schist, containing quartz, mica, graphite, piemontite, and chlorite schists, as well as small quantities of feldspar and serpentine. Around Hataha a poor quality of asbestos is also found, but only in very small quantities. The copper is found at Besshi in the form of a bed, the outcrop of which is on the southern side of the mountain, about 100 feet from the summit. It runs in a single line through the strata at an average angle of 45°, its width varying from 4 to 5 feet up to 30 feet, the mean width being a little over 8 feet. There are eight levels, and a ninth is in course of construction, but it is not yet ready for work to be carried on in it; the depth of the eighth level from the mouth of the inclined shaft is 1300 feet. The galleries are well timbered and packed throughout and supplied with tram lines. The longest gallery is No. 7, which is 3093 feet long, and the shortest No. 8, which is 2736 feet. The greatest output is from the 6th and 7th levels. The ore is extracted by overhead stopping. An inclined shaft runs from the head of the mine to the 8th level at an angle of 49°, and from this crosscuts are driven to the vein. The ore is hauled to the surface in a cage. When the new wire ropeway comes into use the inclined shaft will be used for lowering the ore from the 1st, 2nd, 3rd and 4th levels to the 8th level for transport by the new adit tunnel to Tonaru; the ore from the other levels will be lowered to the 8th by winzes. Hitherto the water in the mine has been pumped to the 4th level, and has been led off by the adit level. In future it will be conducted to a large well on the 8th level, and from there will find an exit through the new adit tunnel to Tonaru, and onwards down the valley to the sea. The circulation of the air in the mine is promoted by the hotter air of the valley being allowed to enter through the adit tunnel of the 8th level and to escape at the mouth of the inclined shaft, near the summit of the mountain, where the temperature of the atmosphere is considerably lower. The air current is made to traverse the various levels by means of doors and stoppings. For blasting, gun cotton is used almost entirely, though dynamite is also employed, especially where much water exists. Black gunpowder is very rarely used. Hinoki (chamaecyparis obtusa) a kind of fir, is used chiefly as timber in the mine, and large forests of it have been planted yearly for the last sixteen years, those planted sixteen years ago being now fit for use. This system of yearly planting will ensure a plentiful supply of timber, which had at one time become very scarce owing to indiscriminate felling. The crushing and sorting is close to the mouth of the inclined shaft. The plant consists of three large crushers. The ore, on being brought to the surface, is crushed near the mouth of the pit and poured down an inclined chute to the mouth of the 4176-foot tunnel which connects the mine with Kadoishiwara on the northern side of the mountain. This tunnel is lighted by electricity and is supplied with a double line of tramway, the trucks of which are hauled by hullocks. On arriving at Kadoishiwara the ore is transferred to the railway running from that place to Sekigasanjo. From Sekigasanjo the ore is taken down the mountain side by two wire ropeways 1 mile long to Hateba, the terminus of the railway, where it is again transferred into the railway trucks and sent to Niihama to be roasted, smelted and refined. But hereafter all the ore will be sent from the various levels down to the eighth level, 1500 feet from the mouth of the pit. From this level

a new adit tunnel, 6000 feet long, connects with Tonaru, the terminal station of the new wire ropeway, now in course of construction. This tunnel has double lines of tramway, which are to be worked by electricity, and the water from the mine is also to be led away by a conduit along one side of it, being eventually conducted to the sea at Niihama. At Tonaru a new crushing plant is being built, after passing through which the ore will be sent down to the sorting rooms below, and, when sorted, it will be poured through shoots directly into the cars of the wire rope line. The crushing, sorting stations and the terminus of the wire ropeway being thus situated respectively one above the other, the handling of the ore is greatly facilitated. The new Bleichert tramway from Tonaru to Kuroishi will be 3600 meters long, the longest span being 600 meters.

It is claimed that 900 tons of ore can be transported in ten hours, the average speed of the hauling rope being 2.5 feet per second. At Niihama there are also coke works, consisting of sixty brick kilns, each of which can produce 1.5 ton of coke in two days. Twelve new ones are now being built. Only coke is employed in the smelting furnaces, the use of charcoal being restricted to the refining process. All the coke is made from coal brought from the Miike mine in Kiushiu. The old reduction works at Niihama were moved to the new works on the island of Shisakajima, 10 miles north of Niihama, where a much larger plant has been set up, the reason for this transfer being a complaint from the farmers of the district that their crops were injured by the fumes from the works. The roasting is carried on in brick stoves, in rows of two, with a common smoke flue running down the center. They are made of slag bricks. There are 549 such stoves for roasting ore and 126 for roasting regulus, and each has a capacity of thirty tons. Roasting is continued for thirty days. For smelting the ore there are three furnaces, each having a circular metal forehearth. The forehearth was at first made of iron, but it was found that they were very quickly corroded by the action of the salt water, used for cooling in the water jackets, and copper ones were substituted for them. The furnaces are rectangular in shape—16x3.2 feet and 13 feet high—the apertures for inserting the charge being on the 30-foot level. Each furnace has twenty-two blast pipes, fed by five large blowers, driven by a 300 H. P. Corliss engine. The blowers make 250 revolutions per minute and have a capacity of 60 cubic feet of air per revolution; they also supply the blast for the second smelting furnaces. The smelting capacity of the furnaces is 187.5 tons of roasted ore in twenty-four hours, and the ratio of regulus to roasted ore is 20%. The smoke flue is placed over the center of the furnaces and consists of an iron cylinder 15 feet in diameter, lined with fireclay. In the inside of the flue large sheets of metal are suspended from the top and fixed at intervals apart; beneath these discs conical boxes, with sliding apertures at the bottom, are attached to the cylinder. The smoke from the smelting furnaces is loaded with dust, which contains from 3% to 4% copper, and, being intercepted in its passage down the flue by metal discs, is deposited in the conical boxes beneath, from which it is collected and made into a soft paste and baked hard by placing it on the roofs of the roasting stoves, after which it is sent to the smelting furnaces. Refining is carried on by means of two reverberatory furnaces, the capacity of each being about fifteen tons per diem.

**MEXICO.**

The following decision has been issued by the Finance Department: Article 47 of the regulations of March 30, 1905, directs in Section II that the exportation of the precious metals which have been brought into the country for treatment therein must take place through the same person as imported them. The President of the Republic being desirous of affording to the mining industry all possible facilities, and in view of the fact that some metallurgical companies have asked this Department that under the conditions of Article 47 of the regulations permission be allowed for the exportation of the metals through a custom house other than that through which they were imported, has seen fit to grant the request. In consequence it will be lawful to effect the re-exportation through a custom house other than that through which the importation took place, provided that the rules contained in said regulations be observed, and that, moreover, in special cases of re-exportation through a custom house other than that of importation, the following rules be complied with: 1. The accounts referred to in Art. 50 of the regulations of March 30 last will be kept not only in custom houses of entry but also in the general custom houses bureau. The assay certificates mentioned in the same article will be sent in duplicate to the custom house of entry and to the general custom house bureau. When it is desired to effect the exportation through a custom house other than that of entry, the interested party will make a request to that effect to the general custom house bureau in order that it may issue its orders, and when receiving advice of the exportation having taken place, it may charge the account of the interested party with the quantity of precious metals exported and may notify the custom house of the importation in order that it may also charge his account with the same amount.

**Aguaascalientes.**

The tin deposit, 40 miles from Aguaascalientes, being developed by C. Pettich, W. A. Pratt, H. Foster and H. Moran, is producing some tin.

**Chihuahua.**

The Chihuahua Enterprise reports that a smelter is to be built at Tabalopa, 3 miles below Chihuahua. Governor Creel says that a concession has been granted for building three reduction plants, aggregating 1000 tons daily capacity, to the American S. & R. Co. F. C. Woodhurn, agent of the company, is at Chihuahua. The initial capacity of the plant is to be 500 tons daily.

**Sonora.**

(Special Correspondence).—The Mineral Hill Co. Co., with its mines in the San Xavier district, has blown in its furnace and is shipping a carload of matte



daily to the Copper Queen Co. Ore is being taken from five shafts on its mines. Another furnace is soon to be blown in and a third is to follow.—At the El Globo mines near Nacozari bids are being made for the construction of a stamp mill, which will begin operations as soon as built on milling ore on the dumps.  
Nacozari, May 15.

The Red Mountain M. Co. has taken over the Cerro Colorado mines, Diego Moreno, in the Altar district, 75 miles southeast of Santa Ana. G. B. Earnshaw of Nogales is general manager. A mill of 500 tons daily capacity is said to be among the plans of the concern. A pumping plant and 6 miles of pipe line to supply water are to be put in.—A 20-stamp mill is being put in at the Martha mine at El Tiro.—F. Monteverde of Hermosillo has sold to A. H. McKay of Santa Barbara, Cal., the Concordia copper mine, 16 miles east of Hermosillo.

## Personal.

G. A. SCHROEDER, a mining man of Denver, Colo., is in San Francisco, Cal.

J. A. ZWARGEL is superintendent Independence G. M. Co., at Red River, N. M.

S. E. BRETHERTON will be in Denver, Colo., about June 5 on mining business.

C. H. MORRIS is superintendent Charter-Raton M. & C. Co., Breckenridge, Colo.

W. E. JONES is superintendent Lluvia de Cohe mines near Hermosillo, Sonora, Mex.

H. CLERC assumes charge of the assay office at the Copper King mine, Letcher, Cal.

C. WOODCOCK has been elected manager Arizona-Nevada Con. G. M. Co. of Bisbee, Ariz.

C. C. MATTHEWS has resigned as superintendent Oregon Securities mine at Bohemia, Oregon.

CHAS. A. DEOLAN is now field manager for Makeever Bros., with headquarters at Marsh, Idaho.

A. C. CUBILLAS has been appointed Federal mineral agent for the Arizpe district at Cananea, Sonora, Mex.

F. M. MOTT of Oakland, Cal., has been appointed manager Los Cochinos M. Co. at Los Cochinos, Sonora, Mexico.

L. R. BUDROW is manager Tiro G. M. Co., operating the Tiro General mine at Charcas, San Luis Potosi, Mexico.

L. M. KING, of the firm of Simonds & King, has returned to San Francisco, Cal., from a professional trip to Nevada.

W. C. HOWARD, general manager New Comstock mines, has been near Kingman, Ariz., from San Francisco, Cal.

J. E. MORRISON is manager Richfield M. Co., working copper mines near Tuape, in the Ures district of Sonora, Mex.

E. L. SMITH has left Breckenridge, Colo., for Seattle, Wash., where he is building a dredger to be used at Nome, Alaska.

A. H. SEEP, vice-president Mine & Smelter Co., Denver, Colo., has returned there from an extended trip through Cuba and Mexico.

R. G. MULLEN will be general manager and J. Taylor will be superintendent of the smelter to be built at Jarilla, Otero county, N. M.

R. E. POSTLETHWAITE has assumed the superintendency at the Potrero, Cal., works of the Risdon Iron Works, vice R. S. Moore, resigned.

R. C. BERKELEY, Pacific coast manager Minneapolis Steel & Machinery Co., Minneapolis, Minn., has returned to San Francisco, Cal., from an Eastern visit.

JOS. RUSSELL will leave San Francisco May 26 to take charge of a gold and tin placer mine at Lagoon Mountain, 100 miles inland from Nome, Alaska.

T. H. TRACY, manager mining machinery department the Power & Mining Machinery Co., Cudahy, Wis., was in Denver last week on his way West.

H. J. SISTY, manager La Libertad mine at Campana, Sonora, Mex., has returned to the mine from New York and West Virginia and will resume development work.

T. B. CROW of Idaho Springs, Colo., has accepted a position as mill manager and metallurgical engineer of the Colorado-Oregon M. Co. at Bohemia, Or., and will take charge June 1.

## Commercial Paragraphs.

THE Keystone Lubricating Co. of Philadelphia, Pa., have opened an office in New York City, room 205, No. 253 Broadway, with Wm. F. Bilveu in charge.

THE Ahendroth & Root Manufacturing Co., Newburgh, New York, have moved their Chicago office, of which A. F. McIntyre is manager, to their new offices at Monadnock Block. This company manufactures spiral pipe, water tube boilers, etc.

THE S. H. Supply Co., Denver, Colo., are furnishing the Ohio-Mexican M. Co., Mexico, a 48-inch, round, water-jacketed copper matting furnace, forehearth, No. 4 positive pressure blower, slag pots, matte pots, 80 H. P. boiler, 60 H. P. engine and electric outfit for lighting.

ROBERT S. MOORE, for many years superintendent Risdon Iron Works, San Francisco, Cal., and John T.

Scott, former superintendent Union Iron Works, San Francisco, Cal., have bought the long-established National Iron Works, San Francisco, Cal., from Marshutz & Cantrell, and will continue the business, with many improvements, additions and alterations.

THE Chromo Steel Works, of Chrome, N. J., have introduced two slight changes in the shoes and dies for stamp mills made by them. One is a slight horizontal corrugation of the shoe shank, which they claim fixes the shoe more firmly in the bosshead, lessening the liability of a shoe dropping out, when the mill is in operation. The other is a depression made by the hydraulic press in the base of the die. This shallow saucer-shaped depression is about 5 inches diameter and 1 inch deep, equivalent to about six pounds in weight. When the die is worn down the loss of weight is in favor of the buyer, as there is that much less waste material.

OFFICERS of the American Smelting & Refining Co. have issued a statement of recent acquisitions and improvements in this country and Mexico. The American Smelters Securities Co., which will succeed to the business of the Guggenheim Exploration Co., has a capital of \$77,000,000. It will be controlled and managed by the American Smelting & Refining Co. The principal properties claimed to have been taken over by the American Smelters Securities Co. are "the Selby Smelting & Lead Co. at San Francisco, Cal., and the Tacoma Smelting Co. at Tacoma, Wash., and operating lead-copper smelters, to which has recently been added a copper electrolytic refinery and plans for copper rolling mills and wire mills. With these smelting plants has been secured a 25-year contract for the entire output of the Bunker Hill & Sullivan mines." Under the original organization of the American Smelters Exploration Co. there was taken over from the Guggenheim Exploration Co. all of its properties in this country with the exception of the Esperanza gold mines. To these properties have recently been added the Central Smelting Co. of Missouri, which is tributary to the lead smelter of the company at Alton, Ill., having a capacity of 125 tons of pig lead daily. Funds are provided for a copper smelter near Salt Lake City, Utah, now being erected and requiring \$3,000,000 to complete and supply with sufficient working capital. In connection with the development of the mining properties at Velardena, Durango, Mexico, owned by the Securities Co., a lead and copper smelter is being constructed. The funds are also in hand for a copper smelting plant in California which will require an outlay of \$2,500,000. Plans are being drafted for a lead and copper smelter at Chihuahua, Mexico, and for the lead-silver business the patents of the Huntington & Huberlein roaster for the United States and Mexico have been acquired. To care for the output of the smelters now planned the copper refinery at Perth Amboy, N. J., is being enlarged by an increased refining capacity of 72,000,000 pounds per annum.

## Trade Treatises.

Chas C. Moore & Co., 63 First St., San Francisco, Cal., are sending out detailed data sheets regarding the Moore oil engine and descriptive literature thereof.

Catalogue No. 43 of the F. M. Davis Iron Works Co., Denver, Colo., describes in detail the operation of the Ferraris ball mill, which is designed for wet crushing.

Bulletin 505 of the Sprague Electric Co., 527 West Thirty-fourth street, New York City, details the advantages and uses of their flexible steel-armored hose for steam and air transmission.

A neat brochure, "The Blue Book of Air Compressors," from the Ingersoll-Sergeant Drill Co., 26 Cortlandt St., New York City, briefly describes and pictures various types of air compressors.

The Little Jap hammer drill is portrayed and described in Bulletin No. 2001 of the Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York City. This drill requires no mounting and is to be handled by one man.

"Firing Blasts by Electricity" is the subject of a 32-page booklet giving a detailed illustrated account of a successful device for such work. It is issued by the Aetna Powder Co., Chicago, Ill., and is worth reading.

The Westinghouse Electric & Mfg. Co. of Pittsburgh, Pa., have issued a handsome booklet on "The Westinghouse Companies in the Railway and Industrial Fields." The story of progress made by this company is of absorbing interest.

Water power equipment for low heads is invitingly set forth in an artistic pamphlet from the Wellman-Seaver-Morgan Co. of Cleveland, Ohio. Turbines are described in different settings and examples of successful installations are shown. It contains a complete power table of standard turbines.

The attractive appearance of the seventh edition of the crane catalogue of Pawling & Harnischfeger of Milwaukee, Wis., gives a favorable impression of their recent crane construction. Description and illustration of details of construction precede handsome engravings of typical installations in mines, smelters and manufacturing plants. It is valuable to those interested in the handling of material.

## Obituary.

PATRICK J. SULLIVAN, foreman of the Rarus mine at Butte, Mont., died recently from appendicitis.

JULIUS BAER, a well-known mining engineer, died at Hunters Hot Springs, Mont., May 8, of hemorrhage, after a short illness. He was superintendent of the Conrey Placer M. Co.

## Books Received.

"Preliminary Report on the Geology and Under-ground Water Resources of the Central Great Plains," by N. H. Darton, Professional Paper No. 32 of United States Geological Survey. This comprehensive volume treats of the geography of the Great Plains, geology of the Black Hills region, Bighorn mountains, Laramie range, Hartville uplift, and of eastern Colorado, South Dakota and Nebraska. It includes an exhaustive discussion on the underground water resources and economic geology of the region.

"Gold Dredging," by C. C. Longridge, is an ambitious attempt to present a complete account of the status of this comparatively recent method of gold mining. The author logically treats his subject by showing the evolution of methods of the early crude attempts to the latest improvements in modern dredging. After a brief historical introduction, he describes and discusses the advantages and disadvantages of the dipper, the suction pump, the clam-shell and the bucket dredgers. The construction, equipment and operation of the last are described in detail, devoting considerable space to costs and efficiency. Then follows an excellent discussion on prospecting and valuing ground, capital required, possible fields and dredge regulations. The book is devoted largely to New Zealand practice, and the recent rapid advance in the western half of America seems to be slighted. A book of this kind seems to be necessarily a compilation in order to be complete. Such compilation judiciously exercised is an admirable time saver for the reader. But when the author presents pages of unabbreviated extracts involving needless repetition of the same facts and then merely refers to other books detailing methods of gold saving, a proper balance of the essentials and the non-essentials seems to be lacking. In short, the treatment is somewhat verbose. It is adapted more to the needs of the possible investor, desirous of informing himself on the elements of the subject, than it is to the miner whose library room is limited. The author gives the impression that American dredgers are worked almost entirely by spuds, which is not in accord with recent head line workings in California. The numerous half-tone illustrations form an important and valuable feature of the volume. On the whole, while it is lacking in details of recent American practice, yet it gives a better idea of dredging in general and of New Zealand practice in particular than any book yet received. It is published by the Mining Journal, 46 Queen Victoria street, London, England, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of \$2.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

BEER COOLER.—No. 788,895. May 2, 1905. Richard Fincken, San Francisco, Cal. The object of this invention is to provide a simple device which can be readily attached to and detached from any keg in use and which is so adapted to envelop the faucet with a cooling medium that one cold glass of liquor after another may be drawn from the keg, while at the same time the cooler will not interfere in any way with the ordinary operation of the regular faucet. The device comprises a container adapted to hold a cooling medium means for detachably securing it to the head of the keg, said container having a re-entrant wall portion partially inclosing a space to accommodate a faucet; a hinged closure for said space, and a spring-pressed plate carried by said closure to engage the side of the faucet to exclude air from the latter.

PENCIL.—No. 788,998. May 2, 1905. Albert E. Buckingham, Oakland, Cal. This invention relates to improvements in pencils. It is especially designed for use in that class of pencils in which the movable lead is fitted to a body or holder and is slidable therein, so as to advance from time to time, as required. This device comprises a means for advancing the lead and for holding it at any point of advance. It consists of an outer body having a central channel and a longitudinal slot connecting the channel with the exterior of the body, a cylindrical sleeve surrounding and slidable upon the body, said sleeve having a slot or channel coincident with the slot of the pencil body, an exterior sleeve fitting the first named and having interlocking edges projecting through the slot in the inner sleeve and the pencil body and into the line of channel containing the marking lead.

METHODS OF CLEANING IMPURE AND VISCOUS SOLUTIONS.—No. 789,478. May 9, 1905. Henry P. Baldwin, Puunene, Territory of Hawaii. This invention relates to an improved method for extracting finely divided substances in suspension from liquids of varying densities and pertains particularly to the separation by centrifugal action of the solid saccharine particles from their liquids in the manufacture of sugar. There are certain liquids, especially solutions of sugar, natural juices of sugar cane and sugar beet, which contain in solution, substances that will crystallize, but are restrained from fully doing so by the presence of other substances in solution and in a very finely divided state held in suspension in the said liquids. The object of this invention is to devise a practical, certain and cheap method for handling heavy syrups whereby a complete separation of the liquid and contained solids or matter capable of crystallization may be effected. The method of cleaning an impure and viscous solution, containing objectionable substances of about the same specific gravity as itself, in suspension, in a finely divided state, which method consists in diluting the solution with a fluid until the specific gravity of the dilution, and then centrifuging the dilution whereby the centrifugal force will act upon said objectionable substances against the viscosity of the solution under operation, and thus drive them out.

WINDMILLS.—No. 789,497. May 9, 1905. Alfred C. Johnson, Winters, Cal. This invention relates to improvements in windmills; and it consists in means for positioning the mill with relation to the wind, means for the transmission of power from the wind wheel, and the construction of the wheel, the tower, and intermediate supporting devices. The object of the invention is to provide a wind-propelled wheel so constructed that the most effective exterior portions of the vanes of the wheel are available without the weight of a comparative valueless center. A skeleton tower is also constructed as to allow of a free passage of the air through it, so that the wheel being journaled upon the top of the tower the lower half is exposed to the action of the wind. Means are provided for revolving the wheel and its bearings within the tower and means for transmitting the motion of the wheel to a centrally journaled universally adjustable mechanism through which power may be transmitted to fixed apparatus.

MACHINES FOR SEPARATING AND CLEANING HEMP FIBERS, ETC.—No. 789,504. May 9, 1905. Michael G. McLane, San Francisco, Cal. This invention relates to an improved machine for separating and cleaning the fibers of decorticated or partially decorticated hemp, ramie and like fibrous plants. It consists of a suitable support, an endless carrier mounted on said support, a series of alternately arranged rotary combing devices and tension devices in the path of the material carried, said combing devices turnable in a direction opposite to that of the carrier and having rearwardly curved teeth.



## Latest Market Reports.

SAN FRANCISCO, May 19, 1905.

## METALS.

**SILVER.**—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 57½c, refined (1000 fine); San Francisco, 57½c; Mexican dollars, 47c, San Francisco; 44½c, New York.

**COPPER.**—New York: Standard, \$15.25; Lake, 1 to 3 casks, \$15@15.25; Electrolytic, 1 to 3 casks, \$15.12½; Casting, 1 to 3 casks, \$14.75@15.00. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £64 6s 6d spot per ton.

Copper maintains practically an even price. Large exports are expected to be made the latter part of this month, which has had the effect of steadying the market somewhat.

**LEAD.**—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 18s 9d per long ton.

**SPELTZ.**—New York, \$5.60; St. Louis, \$5.70; London, £23 12s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

**TIN.**—New York, pig, \$29.75@30.15; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 3½c, 35@37½c. London, £135 10s 0d.

**PLATINUM.**—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

**QUICKSILVER.**—New York, \$38.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 per flask of 75 lbs.; Denver, \$45.00.

**BABBITT METAL.**—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

**SOLDER.**—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

**ZINC.**—Metallic, chemically pure, 50c; dust, 3½c, 10c; sulphate, 1½c, 4c.

**NICKEL.**—New York, 55@60c per lb.; ton lots, 40@47c.

**ALUMINUM.**—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

**ALUMINUM.**—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs. 34c; too lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; too lots and over, 31c, Pittsburgh.

## STRUCTURAL MATERIALS.

**IRON.**—Pittsburg, Bessemer pig, \$16.35@16.85; gray forge, \$16.65; San Francisco, bar, 3c per lb., 3½c in small quantities.

**STEEL.**—Bessemer billets, Pittsburg, \$23.00@27.00; open heart billets, \$23.00@27.00; San Francisco, bar, 7c to 12c per lb.

**WHITE LEAD.**—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 3c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 4c per lb. above keg price.

**Dry Lead.**—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

**LIME.**—Santa Cruz, \$1.25 country, \$1.25 city per bbl.

**CEMENT.**—Imported, \$2.15@2.65 per bbl.; California,

carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

**NAILS.**—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

**LUMBER.**—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

## GENERAL SUPPLIES.

**ANTIMONY.**—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

**COAL.**—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, loog ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Suonside, \$8.50, long ton.

**POWDER.**—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg.

**CAPS.**—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

**FUSE.**—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

**CANDLES.**—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

**CHEMICALS.**—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, 2½@2¾c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

**OILS.**—Linseed, boiled, bbl., 60c; cs., 65c; raw, bbl., 58c; cs., 63c; Lucol oil, boiled, bbl., 53c; cs., 58c; raw, bbl., 51c; cs., 56c. Kerosene—Pearl, per gal., 18c; As; tral, 18c; Star, 18c; Extra Star, 21c; Ecocoe, 20c, Elaine, 26c; Water White, in bulk, 11½c; Mineral Seal iron bbls., 18c; wooden bbls., 20c; cs., 24c; Miner; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 16c,

do., cs., 22½c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 13c; do., in cs., 19½c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 52@57c.

**BORAX.**—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

**BONE ASH.**—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

**LITHARGE.**—Pure, in 25-lb. bags, 8@9c per lb.

**MOLYBDENUM.**—Best, \$2.75 per lb.

**CHROMIUM.**—90% and over, 80c.

**PHOSPHORUS.**—American, 70c.

**SODIUM.**—Metal, 50c.

**BISMUTH.**—Subnitrate, 2½c.

**URANIUM.**—Oxide, 3½c.

**MERCURY.**—Bichloride, 77c.

**TUNGSTEN.**—Best, 1.25.

**SILVER.**—Chloride, 90c@1.00; citrate, 55c.

**RED LEAD.**—500 lbs. and over at one purchase, 7c; less than 500 lbs., 7½c.

**MANGANESE.**—Black oxide, 2½@4c.

**MAGNESIUM.**—Pure, N. Y., \$1.60.

**FIRE BRICK.**—Domestic, carloads 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

**FIRE CLAY.**—Domestic, 1 ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 9, 1905.

789,350.—TELEPHONE SYSTEM—A. K. Andriano, S. F.  
789,352.—HOLDFAST—T. N. Badger, Oakland, Cal.  
789,649.—ELECTRIC SWITCH—W. J. Bell, Los Angeles, Cal.  
789,251.—SHAVING MACHINE—J. A. Benedict, Portland, Or.  
789,261.—FERRULE—J. Davy, Oakland, Cal.  
789,593.—ASH DUMP—C. Dorrell, Seattle, Wash.  
789,268.—LUBRICATOR—R. J. Elliott, Santa Cruz, Cal.  
789,492.—MOP HEAD—C. P. Fonda, S. F.  
789,658.—HEAD REST—W. F. Hedstrom, Los Angeles, Cal.  
789,608.—AUTOMOBILE—B. E. Hervey, Spokane, Wash.  
789,333.—GAS GOVERNOR—F. C. Hodgkiss, S. F.  
789,152.—WEEDER—A. J. Jakiel, Shaw, Or.  
789,497.—WINDMILL—A. C. Johnson, Winters, Cal.  
789,663.—MOTOR VEHICLE—O. J. Killip, Redlands, Cal.  
789,604.—PUMP—L. Look, Los Angeles, Cal.  
789,618.—LIGHTER—H. H. Lyon, Riverside, Cal.  
789,331.—BAG FASTENER—D. G. McClay, Santa Ana, Cal.  
789,504.—FIBER CLEANER—M. G. McVane, S. F.  
789,677.—FUEL FEEDER—F. N. Spear, Los Angeles, Cal.  
789,678.—FUEL BURNER—F. N. Spear, Los Angeles, Cal.  
789,184.—COFFEE CLEANER—C. H. Stubbs, S. F.  
789,578.—BEVEL SQUARE—M. G. Swan, Upland, Cal.  
789,639.—AWNING—F. Thoms, S. F.  
789,303.—ORE FURNACE—P. A. Wagner, Carrville, Cal.  
789,643.—PAPER HOLDER—R. G. Whitlock, Los Angeles, Cal.

## Dividends.

Buoker Hill & Sullivan M. & C. Co., dividend No. 92 of \$150,000, payable 16th inst.; total paid since Jan. 1, 1905, \$675,000; total to date, \$2,946,000.

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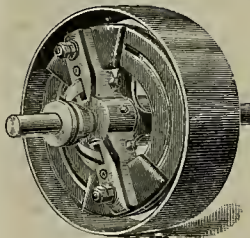
## ANNUAL MEETING.

The Regular Annual Meeting of the Stockholders of the National Cons. Mining Company will be held at the office of the company, 773 Mission St., San Francisco, California, on MONDAY, the 5th day of June, 1905, at the hour of 8 o'clock P. M., for the purpose of electing a Board of Directors to serve for the ensuing year, and the transaction of such other business as may come before the meeting.

GEO. W. FLEISSNER, Secretary.  
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# MINING AND SCIENTIFIC PRESS

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Number 21.

SAN FRANCISCO, CAL., SATURDAY, MAY 27, 1905.

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## Quartz Mining in the Klondike.

Thus far the gold recovered in the Yukon basin, on both the Canadian and American sides, has been from gravels—the detritus of the rocks ground off by glaciers and ice floes, and to a less extent disintegrated by running water. Nearly the entire country is covered with a deep deposit of gravel, overlaid in most places by a greater or less thickness of moss. In California and Australia the geologic and topo-

produce a small amount of gold by the hydraulic method. Although it is not impossible that extensive and valuable bench deposits may yet be found, no deposit comparing either in extent or in richness with the famous "white channel" of the Klondike has been discovered. In that portion of the Alaska interior lying between Circle, on the Yukon, and Fairbanks, on the Tanana, the mountains rise to

point, therefore, in the Klondike region there are two great classes of mining to be considered, namely, creek mining and bench mining. Outside of these two classes there is no mining in the Klondike of productive importance.

The thick covering of moss and gravel renders



Stripping the Violet Vein, Bonanza Creek, Klondike.



Polishing Steel on the Violet Ledge, Bonanza Creek, Klondike.

graphic conditions favor the placer miner. In other countries, notably in Siberia, Alaska and the Yukon Territory, they are inimical to his success. In Alaska, as a rule, alluvial gold is almost entirely lacking where timber and water are plenty, grades steep, and the ground unfrozen. Where gold is distributed in paying quantity water supply is inade-

heights of from 1500 to 2000 feet above the level of the streams, have rounded tops, and slope to the intervening valleys at angles which do not exceed 20°, and often are not greater than 10°. The streams and valleys are on a gently descending plain, the grade of which does not exceed 3%, except in the upper ½ mile, and frequently is not over

prospecting for quartz difficult and discouraging. and outcrops are few. On the head of Bonanza creek, in the Klondike region, some energetic prospecting has been done for quartz veins in the mica schist, and has resulted in the discovery of a gold-bearing vein. This claim has been named the Violet. Accompanying illustrations and another on page 340



Tocopilla, Chile, S. A., Showing Reduction Works.—The Mines are in the Andes Range Back of the Town. (See Page 339.)

quate, timber is poor or altogether lacking, and the miner must provide grade for his boxes and dump for his tailings by artificial means and meet the formidable condition of solidly frozen alluvium. Bench deposits, where gravel can be moved on natural grade, occur in both the Forty Mile and Rampart districts of interior Alaska, and have been made to

1%. The mountains are referred to by the inhabitants as "domes," and the word fairly well describes them.

In the Klondike recent streams have cut the old Pleistocene channels and have reconcentrated the gold. The gold is about equally distributed in the old and in the new gravels. From the miner's stand-

show the discoverers working in the open cuts and shaft sinking with a windlass. The work is being done during the summer and the surroundings are not unlike those found in mines in the Pacific Coast States. It is evident that this vein outcropped at the surface, as in the engraving there is shown very little detritus covering the vein.



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SAN FRANCISCO, MAY 27, 1905.

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## Expert Mine Valuation.

In the valuation of a mine there are many more things which must be determined than the measurement of ore reserves and their tonnage value. There are considerations which require the mature judgement which comes with broad experience. The novice or the inexperienced young engineer is apt to overlook matters of grave importance, while, perhaps, magnifying other things of minor merit. The ore may, perhaps, possess an element which renders its successful treatment both difficult and expensive, and yet, the assays do not show this mineral to be present in quantities which suggest metallurgical difficulties. The tonnage of ore available, as determined by mine development, may be large and the values may be sufficiently high to suggest good profits on mining and milling operations; still, the presence of this single element may overthrow all calculations as to cost of reduction and percentage of values that may be saved. Take as an instance a well developed mine with a large tonnage of good grade ore in sight. If the ore would readily yield a liberal percentage of its values by amalgamation and concentration, with the possible subsequent treatment of tailings by cyanide, the proposition may offer a substantial inducement to the prospective investor. But let the single element antimony enter in even a small percentage and the saving possible by the well-known processes mentioned is impossible. Extraordinary methods must be employed, such as roasting before amalgamation, or something else may have to be resorted to. Either of these additions to the cost of reduction of the ores may mean the entire elimination of all of the profit that had been contemplated, and the investment of capital in the enterprise becomes at once a hazardous venture.

Very rich ores are often able to bear all the expense of high treatment charges and costly reduction, but such mines are usually held by their owners at a price so high that the investment has little attractiveness for the capitalist. It is the ordinary mine which has a good grade of ore, but which requires experienced, careful and competent management to bring success, that is most frequently on the market.

## Inopportune Expansion.

Every experienced mine manager is aware that the expense of milling ores is less in a large mill than in a small one, within certain limitations. He also usually knows that an increase in capacity in a mill having a given equipment, by means of finer crushing at the breaker, by secondary crushing or by any other means, where no additional expense for plant or power is required, means a decreased direct cost per ton of ore passing through the mill, whether a higher or lower saving of values results. The former case, however, is the most appealing to the ambitious manager, for a big mill sounds well, and an increase in the equipment of the mill sometimes increases the manager's estimate of his own importance and value; but this desire for a large plant occasionally leads to results which end in the undoing of the over-ambitious manager. There are numerous instances where a mine under conservative management has been productive and profitable, but the milling plant has been increased to such an extent that the development of the mine has been found insufficient to keep pace with the demands of the mill for ore. With his big mill completed, the unwise manager finds he must put his entire crew on ore extraction, and the hoisting plant is so busily occupied in handling ore, men and materials that dead work falls behind or is discontinued altogether, and in a few months at most the ore reserves are exhausted, and then comes the inevitable shut-down of the mill to await the result of further development. This is by no means an isolated case, for examples are supplied by every mining State in America, and they are not less abundant abroad. Ultra conservatism is no more deserving of applause than is extreme optimism; for the mine manager may be so slow in adapting newer ideas and making necessary improvements in methods, plant and process that he becomes a back number and is actually losing money at a rate almost equaling the extravagance of his neighbor, the over-sanguine expansionist. One of the essential qualifications of a successful manager

is the ability to see clearly the character and extent of his mine, and to expand his sphere of operations on common sense lines. It is far better to have the mine opened several years ahead of the mill, rather than to have the mill or other reduction works two or three times too large for the mine.

## Engineers' Certificates.

The last Nevada Legislature passed a law requiring hoist and other stationary engineers to pass an examination as to their competency. The applicant must make affidavit that he has had not less than three years' experience in the operation of steam boilers and machinery before the commissioners of the county in which the engineer desires to work can issue a license to him. The object of this law is, of course, to lessen the likelihood of accident in the operation of hoisting engines by incompetent and inexperienced men, but, as wise as this provision of the law may be, it does not guarantee the infallibility of the engineer holding the certificate. Hoisting engineers with many years' experience have become responsible for disasters in most unaccountable ways. One man, who had run hoisting engines for twelve or more years, pulled a dozen men into the headframe of a large California mine several years ago. He made no attempt at explanation further than that he was thinking of something else. Engineers sometimes forget what signal was rung after the skip or cage has been started. When a man is found to be preoccupied in this manner the sooner he is sent to the machine shop (or some other department, where his absent mindedness is not likely to result seriously) the better.

There is a growing tendency to protect the working miner and, aside from the natural disposition of the management to do this, generally wise legislation is about the only way in which it can be accomplished. The miner is usually brave to the point of recklessness, where he has freedom of movement, as is often evidenced in mine workings where danger from caving is imminent, but on a cage, skip or bucket in the shaft he is absolutely helpless, depending wholly upon the engineer, and he realizes this. Those whose duties frequently take them down into mines with the men on the going on or off of a shift have noticed that the miners, usually so light-hearted, free and talkative, when passing up or down the shaft, have little or nothing to say from the time they crowd upon the cage or skip until they have safely reached their destination. This is substantial evidence of their realization of their dependence upon the man at the brakes, and that man should be experienced and reliable.

## Testing Safety Devices.

The State Inspector of Mines for Pennsylvania has issued an order to the effect that all mine managers at once test the safety clutches of cages and skips by detaching the vehicle from the cable and allowing the cage or skip to fall. If the safety clutches are in good working condition and efficient no harm will result, as the cage will be hung up in the shaft by the clutches gripping the guides. If the clutches fail to perform the functions they are supposed to perform the cage will drop to the bottom of the shaft and more or less damage and consequent expense will result. This looks like taking heroic measures, but it is certainly not an unreasonable demand on the part of the inspector, for if the clutches, upon which the men depend for safety in the event of the cable parting, are for ornament only and will not do what is expected of them, they are useless. This order is the outcome of the breaking of three hoisting cables and the death of twenty-seven men, the safety clutches having failed to operate in either case. This example of the Pennsylvania inspector is one which could be followed to advantage by every mine in America where safety clutches are attached to cages and skips.

Where buckets and skips on inclines without safety attachments are in use there is no safeguard for the men riding should the cable break, but where such attachments are provided it should be demanded that they at least be trustworthy, and the clutches should be subjected to a frequent test when the cage and skip is carrying as much weight as it usually does when loaded with men.

THE oil producing companies and owners of the several pipe lines in Texas are, it is said, combined for the purpose of controlling the oil industry of that State. This move is simply along the line of precedent already established in California, Kansas and some other oil producing States.

A MORE recent study of the geology of the Tonopah mining district, Nev., by J. E. Spurr, than that made by him in 1903, and published in Bulletin 225 of the United States Geological Survey under the title, "A Preliminary Report on the Ore Deposits of Tonopah, Nev.," has been made by that distinguished geologist, which has resulted in several modifications of his original ideas as to the vein structure and relative age of some of the more important vein systems of the district. To what extent this change in the theory of the genesis of these deposits and their relative age may affect the legal status of conflicting interests in that camp remains to be seen.

SMELTER fumes from the Highland Boy smelter, Utah, have become particularly vicious of late, judging from a complaint of some farmers living in the same county, who in a suit recently brought against the Highland Boy Copper M. Co. claim that the fumes damaged their barbed wire fence to the extent of \$200. One of the peculiar features of these recent suits lies in the fact that the discovery was not made long since that the fumes were detrimental to barbed wire fences and other property. The great prosperity of Utah is built up on the mining industry, which at this time is flourishing in that State, but a few individuals who own land in the vicinity of the extensive reduction works, which contribute largely to the prosperity of the State, are now able to place obstacles in the way of the successful perpetuation of this flourishing industry, in which millions of dollars are invested and upon which the continued prosperity of the State depends.



## CONCENTRATES.

MANY millmen use tinned screens in the batteries without burning.

ONE POUND of the average Western soft coal is equal to 2½ pounds of dry wood for heating purposes.

THE request for information regarding "faults, sheared zones and breccias" will be found elsewhere herein.

It is generally figured that 1 cubic inch of water, when evaporated under atmospheric pressure, will make 1 cubic foot of steam.

A COLUMN of water 2000 feet high, no matter what the length of the pipe line, will develop a static pressure of 866 pounds per square inch.

THE power obtainable by a given stream of water is, within a small factor, due to friction, directly as the head, but the water is not always applied to the greatest advantage.

CONE pulleys arranged side by side, having the hases reversed, furnish an excellent "variable speed" device. They are often made use of in controlling the speed of concentrators.

THE occurrence of carbonaceous matter in eruptive rock masses may be due to the inclusion of pieces of coal which may be in sedimentary beds through which the eruptive rock has forced its way.

THE symbol for a normal solution is N, and for a one-tenth normal solution  $\frac{N}{10}$ ; a centinormal solution is indicated by the symbol  $\frac{N}{100}$ .

It has been repeatedly stated herein that unpatented mining claims can not be held by simply living on them or visiting them occasionally, but the assessment work must be performed, or the claim becomes subject to relocation.

THE standard of horse power for boilers has been fixed by the American Society of Mechanical Engineers at thirty pounds of water evaporated per hour at a pressure of seventy pounds per square inch from a temperature of 100° F.

A STATION PUMP for mine use is usually designed to remain at some particular level, from which it raises the water to some higher level in the mine or to the surface. Station pumps usually, though not invariably, work horizontally. Sinking pumps are suspended in the shaft and work vertically.

THE cheapest way to handle boulders in a hydraulic mine, where a good head of water is available, is with a derrick operated by water power. Blasting and bulldozing of boulders should be done by a small crew when the greater number of men are absent from the pit.

It is not necessary to explode black powder with detonators. These are only used in exploding nitro and similar high explosives. A train of black powder or the ordinary fuse is all that is needed to communicate fire to black powder.

THE standard sizes of the perforations in mill screens are  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1, 2, 3, 4, 5,  $7\frac{1}{2}$ , 10, 12½, 15, 20, 25, 30, 45 and 50 millimeter and upward, with the gauge of plates used in proportion to the perforations. The fine screens are made of the heaviest metal that can be successfully punched by the needles.

THE cost of trenching and pipe laying in trenches depends on the size of the trench necessary to accommodate the pipe, and the depth to which it is desired to bury it, and also to a great extent on the material through which the trench must be cut; this latter usually varies more or less along any line.

IN mine surveying it is preferable to use steel tapes having a length ordinarily of 100 feet, in preference to the old chain system. The mine plans or maps should be made on a scale which will admit of platting all of the necessary details of the workings. It is customary to adopt a scale of 20 or 40 feet to 1 inch.

CONCRETE may be reinforced with bars of iron or steel—old railroad rails, pieces of old mine or other cables and the like, or, for lighter work, expanded metal. The material chosen should be determined by the class of work to be done. Where floors of concrete are to be laid its durability depends to a great extent upon the character of the foundation made for it.

IN the case where A owns a quartz vein striking N.-S. and B finds a vein striking E.-W. cropping on the same ground (presumably within A's lines, but not stated), B must make a discovery of his vein outside of A's boundaries, and he may then work his "cross lode"

through A's claim, having a right of way through A's vein, but no right to appropriate any of the ore found at the intersection of the veins, as this belongs to A, the prior locator. If B can not make a discovery of the vein outside of A's claim, he will have no grounds upon which to locate a claim.

THE exploders used to fire dynamite, called by miners "giant caps," are nearly all made of the same substance—mercury fulminate in small copper cylinders, closed at one end. The strength of the various caps, X, XX, XXX, etc., is determined by the amount of fulminate placed in each grade of caps. A given quantity of this material has approximately the same explosive force.

MANGANESE DIOXIDE is one of the minerals which usually gives more or less trouble in amalgamating gold ores, either on plates or in pans. Quicklime is the antidote generally employed to correct this. The lime should be added at the breakers in small quantities at a time to insure its more even distribution among the ore. Where cyaniding follows amalgamation the quantity of lime must be gauged, to prevent excessive alkalinity.

PIPES for conveying water, air, or oil when laid on the surface should be provided with occasional expansion points to allow for the range of temperature common to the region where such pipes are laid. Failure to make such provisions may result in serious damage to the line, by reason of the shrinkage and expansion of the line at the variable temperatures to which it is subjected. In some regions the ranges of temperature is as high as 150°.

TO ASCERTAIN approximately the amount of water a pump of given diameter of cylinder will raise at a piston speed of 100 feet per minute, square the diameter and multiply by 4. Thus a pump having a diameter of 6 inches and running with a piston speed of 100 feet per minute will raise  $6 \times 6 \times 4 = 144$  gallons of water per minute. In a single acting or plunger pump the travel of the piston can only be counted in one direction, but in a bucket-plunger or differential pump each movement of the piston is counted.

IN most large concentrating mills, where galena, pyrite, etc., are to be concentrated from a gangue, the equipment consists of rock breakers (jaw or rotary), rolls, etc., trommels, elevators, jigs and some device for finer concentration, such as vanners, tables, or buddles. The plant should be arranged to operate by gravity as far as possible, though where sufficient fall is not obtainable, conveyors of various kinds cheaply elevate the material to further pass by gravity from one stage to another of the process.

AN involute may be described as a curve which rolls upon another curve without sliding. The cam arms of a stamp battery are involutes of the circle described by the hub of the cam. This curve may be drawn by wrapping a string around the hub of the cam and attaching a lead pencil to one end of the string, the other end being held firmly. Then unwind the string, keeping it drawn tightly, and marking with the pencil point the curve thus described by the end of the string.

D. G. DEL PRAT, manager of the Broken Hill Proprietary mine, New South Wales, states in the twenty-first volume of the Transactions A. I. M. E. that in filling the workings of a large iron mine in Spain he used no fines whatever. All the waste employed came from the surface and was placed by hand, and the settling of this filling in a stope 100 feet high did not exceed 1 foot, and usually was not over 6 inches. If fines were also used it is probable that the settling would be as much as 10%.

THE quantity of water discharged through the nozzle of pipe under known head may be approximately determined as follows: Extract the square root of the head in feet and multiply this by 8.03. The product will equal the spouting velocity in feet per second. Multiply the area of the nozzle at the mouth by this velocity and the result equals the cubic feet of water discharged per second. Thus a 6-inch pipe under 400 foot head will discharge  $\sqrt{400} = 20 \times 8.03 = 160.6 \times 28.27 = 4523.8$  cubic feet per second.

THE cost of a dredger depends upon its construction. Dredgers are built for specific work, and a dredger built to operate under one set of conditions may not work to the greatest economical advantage under another set. The important factors to be predetermined when planning a dredger for gold mining are: Depth to bedrock from the level of the water; height of the bank above the water level; depth of water; nature of the gravel or other material to be mined; character of the bedrock—hard or soft, etc.; size and shape of the gold particles to be saved by the machine; cost of transportation from railroad and freight rate from point of building machinery to railroad station nearest the dredger site; cost of lumber delivered on the ground.

SOME geologists believe that the gold veins of Nova Scotia are similar to those of Bendigo, Australia, and the more extensive development of these mines is being conducted along the lines suggested by this belief. The summit of the "saddle" or apex of the anticline is usually the strongest in development of gold-bearing

material, though not always as rich as the ore found in the "legs" of the anticline. The synclinal portions of the series of folds in which these deposits occur are uniformly lower in grade than the anticlines, and sometimes the quartz and gold are entirely lacking in these parts of the formation. The ores are treated by stamp-milling amalgamation and concentration of the sulphides.

MUCH hydraulic cement is being made from blast furnace slags in the United States and it is known by test and experience that, when properly made, the cement thus manufactured is for many purposes as good as Portland cement. Only a slag of proper composition can be used for this purpose. A furnace slag, such as is produced at iron furnaces, having approximately the composition, silica 26%, alumina 16%, lime 55% and magnesia 3%, would probably be suitable for this purpose. The slag must be thoroughly granulated by discharging while hot in an excess of water. Slags allowed to first solidify are not suitable for cement making. The slags from copper and lead furnaces are not suitable for making cement, owing to the large percentage of iron present.

IN California by one barrel of crude oil is meant 42 U. S. gallons, or 9702 cubic inches. Six barrels of oil weigh approximately one ton of 2000 pounds. The drums ordinarily used to transport crude oil contain about 110 gallons of oil, or a little over 2.5 barrels. In speaking of the specific gravity of crude petroleum, the scale of Beaume's hydrometer is referred to, which is used to measure the density of liquids lighter than water. Oil is usually tested for specific gravity when at a temperature of 60° F. For correction it is customary to allow 1° Beaume for each 10° difference in temperature of the oil, above or below 60°. Thus an oil which is 14° B. at 60° F. is calculated to register 13° B. at 50° F.

A FOREHEARTH is placed at a smelting furnace for the purpose of drawing off the molten products as fast as they are formed in the furnace. In the forehearth the metal has a chance to separate from the slag, and both metal or matte and slag may be drawn off separately from the forehearth as desired. The forehearth is lined with clay and silica, something after the manner of a converter. The charge in a forehearth always chills slightly around the edge, thus practically reducing its capacity. At one furnace the experiment was made of building a forehearth of large diameter, but it was found that the material around the edges chilled to a greater extent than before, so that the capacity of the large hearth exceeded that of the small one but little, if any.

THE loss of air between the compressor and the drills may be due to any one or all of several causes. These are leaks in the pipe line; abnormal friction in the pipe line, due to rough pipe, and frequent sharp bends; frost in the pipe line in cold weather and water due to condensation of moisture during moderate weather. Another source of annoyance is the leaving wide open of one of the cocks on a hose which has been detached from a machine after blasting for the purpose of driving out the gases and smoke. This weakens the pressure at every other machine in the mine for the time being, unless the compressor is large enough to easily supply the loss due to this cause. Air pipe lines should be of sufficient diameter to admit an easy flow of air through the pipe and not cause it to travel at a high velocity, thus increasing the friction. It is advisable to use either straight-way or gate valves on air lines, as globe valves cause much loss from friction.

THE theory upon which the "cut hole" idea is based in blasting rocks in place is that a quantity of explosive placed in a hole drilled into the rock will cause the rock to break out a crater or funnel-shaped mass of the rock, the sides of which are supposed to have a slope of 45° to the direction of the drill hole, but this result is only obtained in practice in absolutely homogeneous rock, and not always then. Under ordinary conditions rocks have a certain rift, that is, a tendency to break along certain planes. There are also jointing planes which induce rock to break in various directions other than those calculated theoretically. In placing cut holes in shaft sinking, for instance, if the holes are 8 feet apart at the surface of the rock and directed toward each other at an angle of 45° to the vertical, these holes should meet a common plane of 4 feet below the surface, and the holes would each be about 5.7 feet in depth. When this cut is fired, if it breaks well it is not likely, in hard rock, to break out much back of the line of the drill holes themselves, as the "hurden" on the holes is too great. In many mine workings in very hard rock the fallacy of the "crater" theory is demonstrated where the line of nearly every hole drilled to the limits of the cutting (drift or shaft) is in plain sight. This usually only occurs in very hard ground. Under favorable circumstances, as in some soft sandstone, the breaking of the ground may exceed the calculations of the miners. Miners drilling by hand usually figure much more closely on the effect of each hole drilled than do machine miners, who place holes systematically over the face of drift or bottom of shaft, trusting to over-charge of powder to do the work. Many miners show lack of judgment in the use of high-grade powder, using as large an amount of No. 1 70% nitro powder as they would customarily use of No. 2 40%, though the former has nearly two times the explosive force of the latter



## The Compression of Stope Fillings.\*

Written by B. J. OBERHAUSEN.

In the Ruhr coal district there is a generally accepted saying that when the rooms are filled with waste the amount of setting which takes place does not exceed 40% of the thickness of the seam; and that, as a rule, the settling is much less than this maximum. Up to the present time no definite data relating to the matter have been published. Certain small scale experiments, which were made at shaft No. 2 of the Kaiser mine by means of a brick machine, confirmed in a general way the supposition referred to above. The results of these experiments are given in the table, which shows, for the various materials used for filling, an average compressibility of 32.3% of the volume originally occupied.

The exploitation at the above-mentioned mine has recently furnished facts which lead to more definite

won from rooms which are afterwards completely filled, together with the adjacent development work. The strata overlying the coal formation have an average thickness of 220 m. and consist largely of the younger formations, mainly Upper Cretaceous. The seams being mined are those marked No. 1 and A, B, C, D and G on the accompanying section, and are at an average depth of 370 m. These seams vary in thickness between 1.8 and 0.5 m., averaging 1 m. The regular dip to the northwest usually does not exceed 25°, except in the western portion of the area, where, in the neighborhood of a fault, it reaches 60°. Its average is not over 15°. Between the individual seams the formation consists chiefly of clay slates, sandstone and sandy shales occurring only in three horizons, each 20 m. thick, situated respectively between seams C and D, D and E, E and F (Fig. 1).

The methods of mining employed, which depend on the nature of the seams and various local conditions, are as follows:

(a) Strebau—Long wall working, on strike or dip,

most cases it was quite evident that the settling within the seam itself had ceased. Between the foot and hanging walls the filling was hard and tight, having been even squeezed into fissures and cracks formed in the adjoining country rock. The filling forms a compact, breccia-like mass, and has been re-cemented, especially where granulated slag was used, into a hard material which could be broken only by blasting.

A comparison of the various data obtained shows that in Stossbau and Strebau (defined above), when granulated slag and broken rock were used for filling (seams 1, D and G), and when the drifts and inclines were filled at the same time, the setting was a minimum, averaging not over 25.5% of the original thickness. The settling was observed to be much greater than when, instead of introducing outside rock, the filling was composed of country rock broken in the adjacent development work. Especially is this true when the drifts, self-acting, inclines, etc., were only partially filled (seams A and B). Under these conditions the settling amounted to 38%. In seam C the

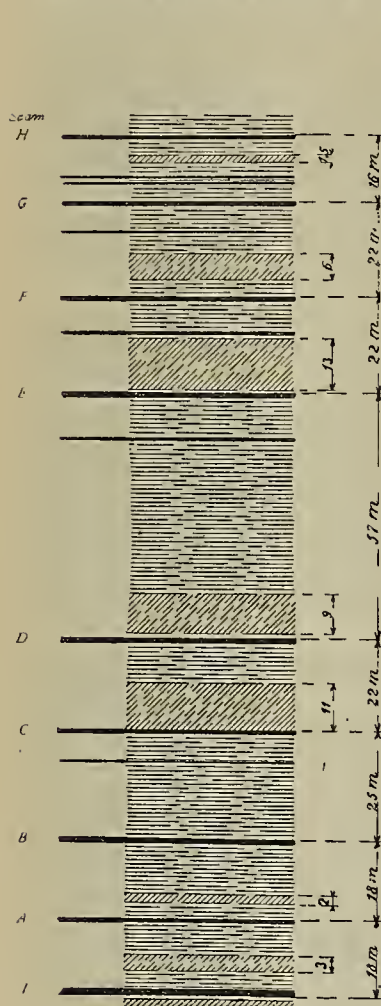


Fig. 1.

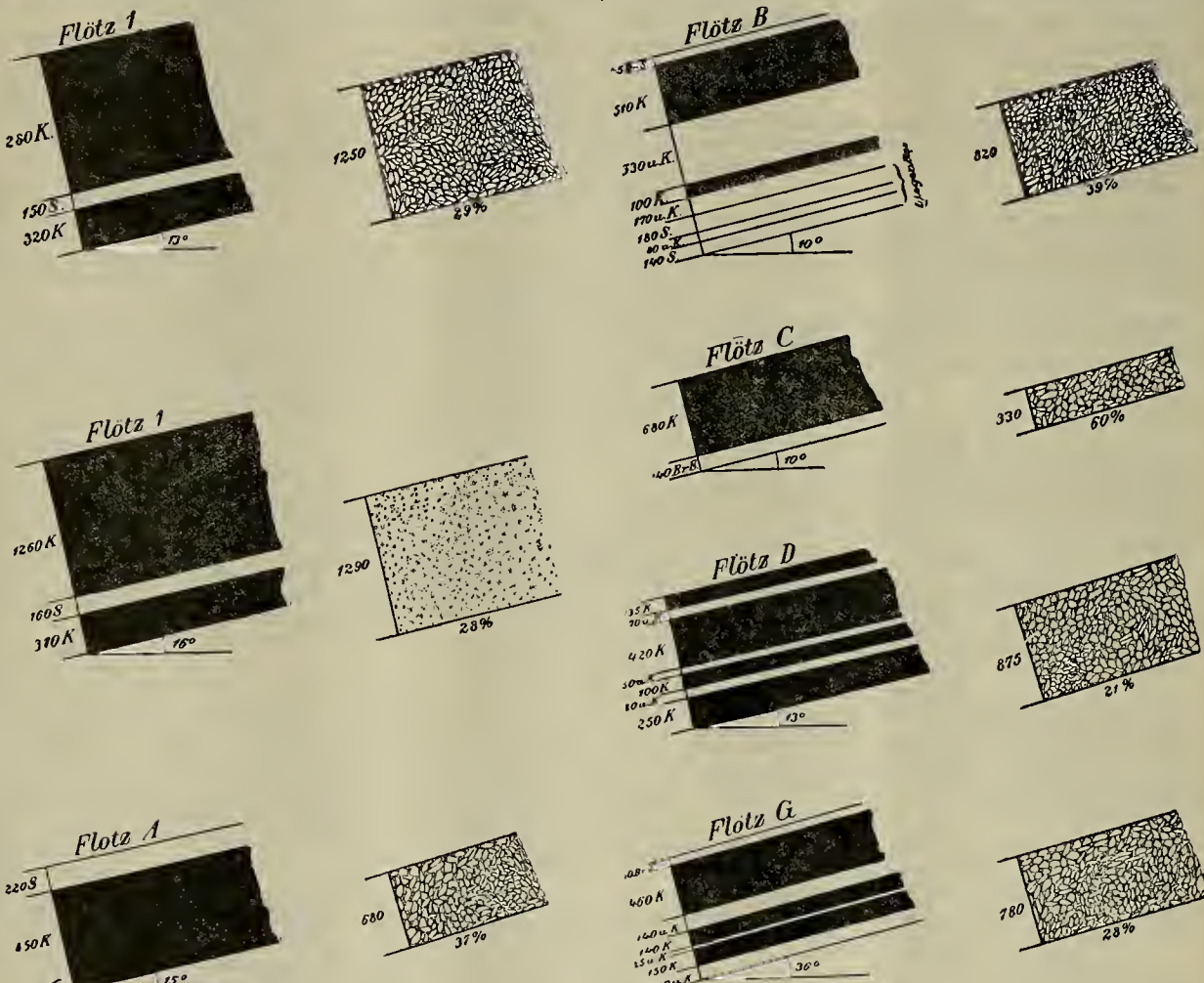


Fig. 2.

conclusions as to the compressibility of the filling. These data being deemed of general interest are given below:

Character of Filling.	Weight per cubic foot, lbs.	Thickness of Filling, m.	Percentage of Compression, %	Remarks.
White granulated slag.....	0.550	74	39	The space in the press charged with filling was 255 m.m. long, 123 m.m. wide and 74 m.m. deep.
Gray granulated slag.....	0.722	74	42	
Dark gray granulated slag.....	0.858	74	45	The pressure die, weighing 700 k., was dropped a distance of 142 m.m.
Black granulated slag.....	1.201	74	49	
Ground clay slate, up to 5 m.m. in size.....	1.201	74	56	Material to be tested had to be committed before charging the press.
Ground micaceous sandstone.....	1.297	74	59	
Ground sandstone.....	1.317	74	61	
Mason's sand.....	1.250	74	53	
Cinder.....	0.742	74	44	
Coal slack.....	1.021	74	54	

The field of operations of the company lies chiefly in a district frequently flooded by the Rhine and the Ems. This induced the mine management to adopt the plan of filling the workings, in order to reduce to a minimum the surface depressions incidental to mining. In the area tributary to shaft 2, near Marxloh, this system has been carried out in a most complete manner. The daily production of 2200 to 2300 tons is

either with straight face or series of stepped or off-setting faces.

(b) Stossbau—Overhand breastwork, on the strike or to the rise, in horizontal slices, with use of filling.

(c) Stoss-Firstenbau—Overhand breastwork, in steeply dipping seams.

The material which was used for filling comprises: (1) Waste rock broken in mining the coal; (2) waste rock broken in prospecting and development; (3) waste picked out from the run of mine at the surface; (4) granulated slag from neighboring iron works.

For the normal production of 2300 tons per twenty-four hours there are used as filling: Of No. 1, 125 tons (250 loads); of No. 2, 250 tons; of No. 3, 15 to 20 tons, and of No. 4, 200 tons. This filling is conveyed to the working places partly through the airways and partly through the haulage gangways.

During the past year at the Kaiser No. 2 mine, it has been decided that air and haulage ways, which must be maintained for a long period of time, are best run through the old stope fillings. For this reason several considerable portions of the mine, which were worked out some years ago and subsequently filled, were again opened by drifting through them.

The original thickness and composition of the seams was accurately known from former records, which have been carefully kept for each portion of the mine. The thickness of the worked out and filled seams were measured at a number of places during the driving of the new drifts and the resulting averages obtained. Self-acting inclines, raises and airways were driven practically through the middle of the various worked out areas of ground.

The country rock and the filling found in place where penetrated by the various new drifts, and in

rooms were only partially filled to a breadth of 6 m. with waste broken in the drifts. The adjoining drifts, which were 2 m. wide by 1.5 m. high, were originally left opened and have not yet closed completely. Such material as they contain has in part been squeezed into them from the rooms. Here the settling has not ceased, although already amounting to something like 60% of the thickness of the seam, (Fig. 2).

The facts noted show that the compression will average 30% of the original thickness when the workings are completely filled with waste. Observations made in seam C indicate that with partial filling, that is, without introducing outside material to supplement the waste from the mining operations, and without filling the drifts and inclines, the amount of settling will still be materially less than resulting from a system of mining with no filling whatever.

The results first mentioned in the preceding paragraph confirm in a measure the view generally accepted in the Ruhr district concerning the amount of settling which takes place when the rock filling is employed; that is, when the filling is carefully and completely carried out, there need not be more than 30% settling. It is intended to continue these observations, and it is expected that the new system of filling now proposed at the Kaiser mine, in which granulated slag will be used, with water as a transporting agent, will show more favorable results than the old systems still in vogue.

KITCHEN-MIDDENS, referred to in geological writings, are heaps of shells and earth, presumed to be the accumulation of the waste or refuse of feasts held periodically by tribes living upon or near the coast. These mounds are found along the seashore.

\*Translated by C. R. Corning and R. Peele for School of Mines Quarterly, from Glueckauf.



## Shaft Timbering at the Kennedy Mine.

Written for the MINING AND SCIENTIFIC PRESS by  
F. J. GIRARD.

The Kennedy mine, which is located near Jackson, Amador county, California, possesses the distinction of being the deepest mine in the State, ore being removed at the present time from a vertical depth of 2500 feet. Recently 217 feet have been added to the vertical shaft, giving it a depth of 2803 feet, and at present the crosscut to the vein for the 2700-foot level is being run. The shaft is in the hanging wall greenstones, and, being in hard rock and at a great distance from the vein, there has been no trouble from swelling or settling of the ground. There are three equal sized compartments, two being used for hoisting and the third containing the ladders and air pipes.

Before commencing the recent sinking a bulkhead was built across the hoisting compartments below the 2500 chute and the third compartment boarded up, so that the hoisting need not be interrupted during sinking. This bulkhead consisted of three layers of 12 by 12-inch timbers, those of the middle layer being at right angles to those of the other layers. Guides were placed in the third compartment for the

through the upper hanging bolt hole of the plate. After the set had been hung 3-inch blocks were nailed on for bridging blocks and 3-inch planks nailed on all around the set for bridges. Split lagging were used and were placed where needed, close lagging not being necessary owing to the hardness of the rock. Blocks for tightening the set were placed opposite the ends of the wall and end plates and center braces, and wedges of varying thickness were driven between the blocks and the rock. Between the blocks and the bridging boards, or between the blocks and the plates where the ground was too close for bridging, thin wedges (their butts being 1 inch thick) were used. Hard pine was used for the wedges, as the sets would not tighten well if soft wood were used.

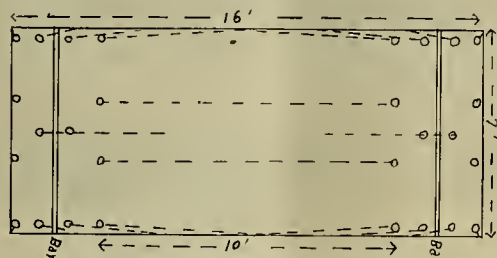
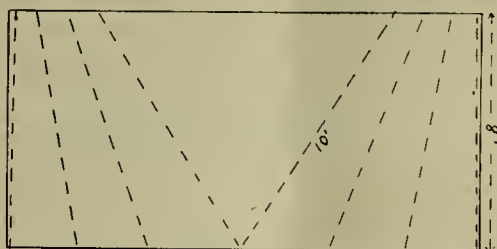
For lining the sets two plumb lines were used, one in each of two diagonally opposite corners. Pieces of inch boards were nailed to one of the higher sets and the plumb lines hung over these so that they cleared all the lower sets, the lines being kept suspended from the same points until they had reached a length of 75 or 100 feet. A saw cut for lining was made 14 inches from the inner corner of the set by the framer, and over this the timbermen nailed an inch piece with a saw cut that came opposite the one in the wall plate, the former cut being brought to the plumb line. When no longer needed the inch pieces were removed so the lines could swing clear.

Pine timbers with the following dimensions were used: Wall plates, 16 feet by 12 inches by 12 inches,

## Shear Zones and Breccia.

Written for the MINING AND SCIENTIFIC PRESS.

Shearing in rocks is the result of both pressure and movement. The processes by which shearing takes place are well illustrated in a series of properly chosen rock slides under the polarization microscope. There are two kinds of alteration to which rocks are subjected. These are: (1) Metamorphism, or the passage under conditions of high temperature or pressure, or both, of less crystalline into more crystalline compounds; or the change of minerals into others not less crystalline than themselves. (2) Decomposition, or weathering, that is, the passage under ordinary atmospheric conditions of crystalline rock constituents into compounds less crystalline and more soluble than themselves. Both processes sometimes are in progress in a rock mass at the same time. Rocks may be materially altered by simple pressure, but the strains which are generated within them are relieved and adjusted by the fracturing of the individual mineral constituents of the rock mass and a certain amount of movement along definite planes. These movements produce the condition observed in schists and gneisses. The preliminary process in the creation of schists and zones of shearing in massive rocks is the formation of two or more systems of



Figs. 1 and 2.—System of Placing Drill Holes in Kennedy Shaft.

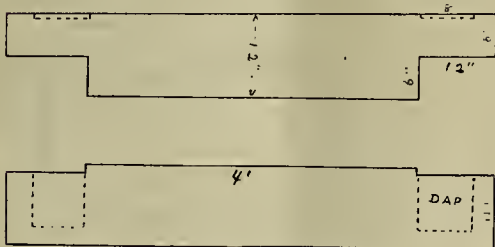


Fig. 5.—End Plate of Shaft Set.

crosshead of a bucket that is operated by a small compressed air engine placed in the 2500 station, by means of which all supplies for the shaft were lowered. The waste from the shaft was hoisted in the bucket and automatically dumped into a chute partitioned off from the station ore chute, and thence hoisted to the surface. The men worked in eight-hour shifts, one engineer, two machine men, and two chuck tenders being employed on each shift.

The machine bars were set up, one in each end of the shaft, so that they were 6 inches from the inner sides of the end plates, and all the holes drilled from this one set up. Figs. 1 and 2 show the disposition of the bars and the method of placing the holes. The cut holes were aimed to meet in the middle and were 10 feet deep, the back holes being 8. The entire round was drilled with the machines on the outer sides of the bars. All the holes were blasted at one time and the bottoms blasted until all had broken. An average of 13 feet per week was made.

For the use of the timbermen a stage was suspended by means of four chains which were attached to the hanging bolts above the last set placed, and which hung on the outer side of the wall plates. To the bottoms of the chains were attached iron stirrups, through which passed 4 by 4-inch wooden pieces; on these were placed 16-foot planks, and on these 7-foot planks were laid crosswise to make a tight floor. The stage was removed and the long planks hoisted to the station when a round was fired.

The wall plates were lowered from the 2500 station suspended beneath the bucket by means of a chain and a large clevis, the bolt of which passed

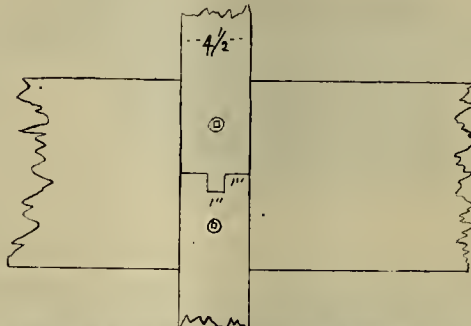


Fig. 3.—Method of Securing Guides, Kennedy Shaft.

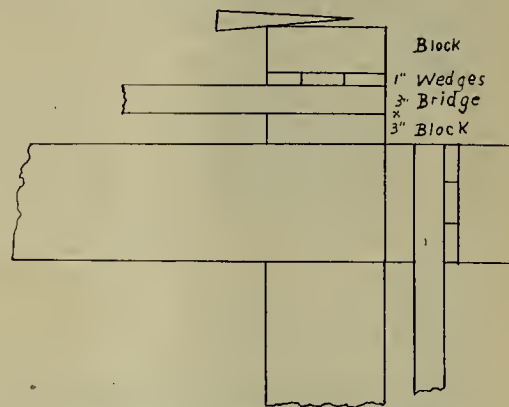
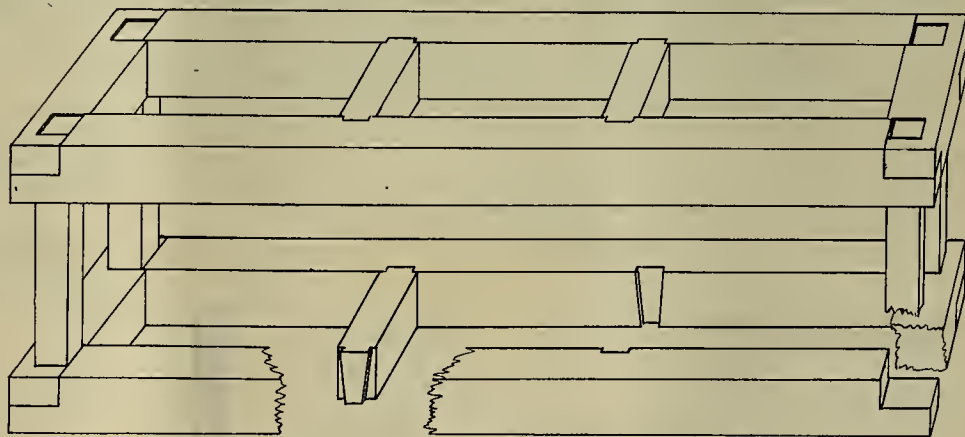


Fig. 4.—Plan of a Corner in the Kennedy Shaft.



Sketch Showing Placing of Timbers in Kennedy Shaft, Jackson, Cal.

with 6-inch by 12-inch by 11-inch horns; end plates, 7 feet by 12 inches by 12 inches, with 6-inch by 11-inch by 12-inch horns; center plates or dividers, 5 feet 2 inches by 8 inches by 12 inches, with beveled horns 1 inch long, 6 inches at top and 4 inches at bottom; posts, 5 feet 1 inch by 8 inches by 8 inches. Gains 1 inch deep, 6 inches at the top and sloping to 4 inches at the bottom were cut in the inner sides of the plates for the reception of the horns on the center braces, and hanging bolt holes bored 6 and 12 inches, respectively, from the inner set corners. Daps or seats 1/2 inch deep were cut in the plates for the reception of the posts, thus making the posts 5 feet in the clear and the sets 6 feet apart from center to center. The three compartments are each 5 feet by 4 feet 2 1/2 inches. Wooden guides 18 feet by 3 1/4 inches by 4 1/4 inches are used and are mortised together and bolted to the center braces and end plate by means of lag screws, as shown in the sketch (Fig. 3).

Fig. 4 is a sketch of a corner in the Kennedy shaft, showing method of placing blocking, the bridge and wedges. Fig. 5 shows a top and side view of an end plate.

THE copper deposits of Rio Tinto, Spain, were known for many generations, if not for centuries, and were worked in a small way by the Spaniards, but it is only since 1876 that they have been largely productive, under English ownership and management. These mines are the principal producers of copper in Europe, the annual output now reaching about 35,000 tons of metal.

jointing planes in the rock. These planes, if crossing each other at low angles and nearly perpendicular to the surface, greatly facilitate the further process of shearing. When the tremendous pressures to which rocks are often subjected are exerted on a rock mass thus subdivided into flat rhomboidal prisms, the individual mineral crystals are fractured, flattened and drawn apart. These phenomena may be plainly seen with the aid of the microscope. The flattened prisms are drawn out longer and flatter and eventually they are so much distorted by pressure and movement that the original minerals are wholly lost sight of. Augite or hornblende are fractured, flattened and drawn out, and by chemical alterations they pass over into fibrous hornblende, and by further change into scales of chlorite. If the rock is still further altered epidote is likely to appear. Feldspars are altered, passing over into mica and other minerals. Calcite develops as a product of the alteration of the various silicates, and quartz grains are crushed to powder and sometimes are dissolved and redeposited as a cementing material, forming siliceous schists, etc. Zones of rock which have been subjected to this process are described as zones of shearing, and they may be a few feet in width or they may extend over many miles of territory. Slates are often formed in the same manner. Sometimes slates are cleavable along the planes of bedding, but as often they are found to have been subjected to pressure and shearing, as above described, after the formation has been folded. In such event the planes of cleavage and the planes of sedimentation may cross each other at right angles







roads has noticed that when materials in the road are not compacted, there is a constant tendency towards separation by sizes, as the materials have a tendency to work down through the voids and gradually bring the coarse material to the top. In a circular drum the material settles at the lowest point, and when agitated the finer materials work through to the bottom. Each revolution assists at a separation of the material according to sizes. Deflectors are necessary and they scoop up the fine material at the bottom, carry it up and cast it on top so it may again work through. The coarse material is not touched until enough fine stuff has been scooped from the bottom to enable it to settle low enough to be caught by the deflectors. This action is best observed when the mixer is discharging. The mortar comes first and is followed by the stones. When the cylinder is very long the deflectors pocket the fine material and discharge the coarser.

"Concrete in wheelbarrows may look good, but the test of service, or examination in a testing laboratory, shows the difference between cube mixed and deflector mixed concrete.

"A cube revolving on an axis through diagonal corners has the intermediate corners alternately on either side of the center line. The mass is thus thrown bodily from side to side six times in each revolution. As the cube does its best work when

## Reduction of Cinnabar at Sulphur Creek, California.

Written for the MINING AND SCIENTIFIC PRESS.

All those who are familiar with the quicksilver mines of the world are also acquainted with the usual methods of quicksilver reduction from its ores. The ore is mined in the usual manner, the same as the ores of gold, silver, copper, etc., but the reduction of the ores of mercury is distinctive, and throughout the world, wherever quicksilver is mined, the method of the reduction of the ores is carried out on essentially the same lines. The ore is usually divided, by rough screening over grizzlies, into coarse and fine, and these two classes of ore are treated in shaft furnaces by the application of fire, the fire boxes being on the sides of the shaft, but communicating directly with the ore. There is considerable difference in the details of the various furnaces built for treating cinnabar ores, but the principles are essentially the same.

In a few instances, and notably at the Socrates mine, in Sonoma county, Cal., the ore is reduced in a rotary cylinder furnace of the White-Howell type, into which the ore is fed continuously, the furnace revolving very slowly. The vapor is carried into the usual condenser, where the mercury is collected, the

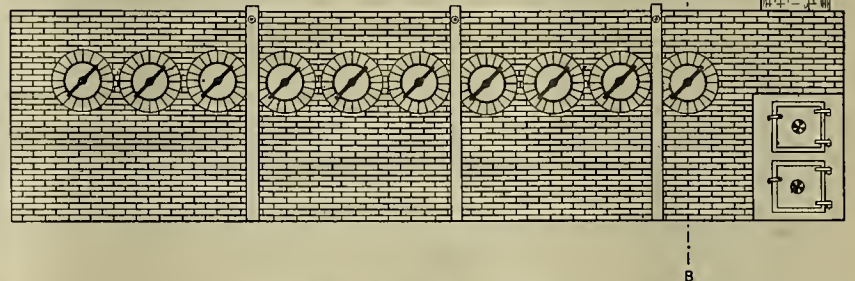
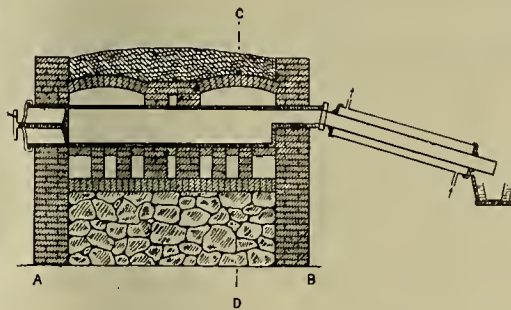
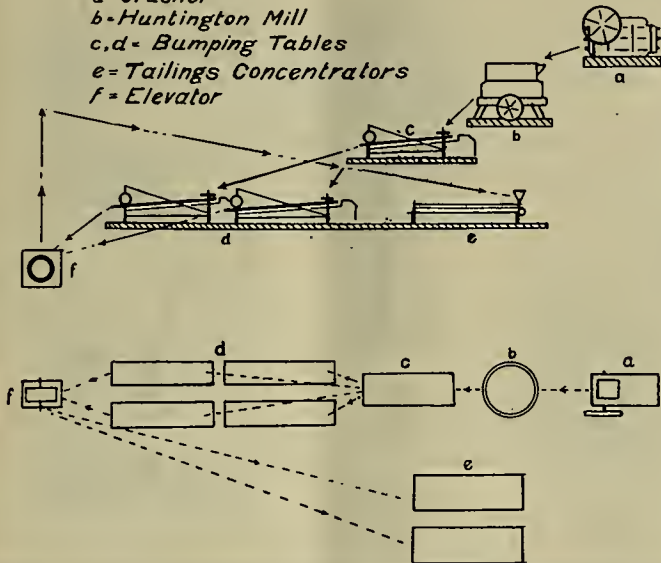
mill, the daily capacity of which varies between 50 and 120 tons, according to the rock. The ore is ground to pass a No. 7 slot screen, which is equivalent to a 30-mesh wire screen. From the mill the pulp is divided (not sized) and sent to two bumping tables, adjusted to secure a coarse concentrate containing usually over 60% cinnabar. The tailings from these bumpers are sent to a second set, which are adjusted to recover the fine cinnabar escaping the first tables. Mr. Northey intends to add more tables, with a view to making a closer saving, if possible, but he has long since realized the difference between saving the last grain of cinnabar as a scientific possibility and saving all that can be saved economically. The concentrates are treated in individual retorts built in a bank of 12. The accompanying illustration shows the character of the retort, with a sectional view of its operation. Formerly this retort consisted of 10 units, 2 having been since added. Sketches of condensers used at the neighboring Boston mine is also shown.

The plant as compared with the usual type of cinnabar reduction works is inexpensive, and possesses the additional advantage of being adapted to a gold mine in case the cinnabar is exhausted and it becomes necessary to close down, while under these circumstances the shaft furnace would be useless.

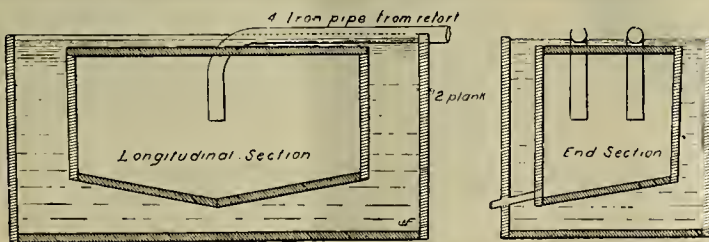
Some curious, and, as yet, inexplicable phe-

Plan and elevation of Concentrating System.  
Manzanita Mine.

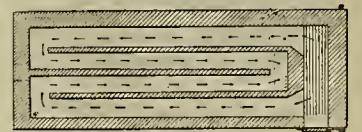
- a-Crusher
- b-Huntington Mill
- c,d-Bumping Tables
- e-Tailings Concentrators
- f-Elevator



Retort Furnace, Manzanita Mine.



Condenser at the Boston Mine.



Johnson-McKay Retort.

making fifteen revolutions per minute, this means a bodily movement of the mass ninety times each minute. This mass movement is combined with one, which continually subdivides the loose concrete and carries it in thin layers upon each of the six sides. When the surface slope exceeds the angle of repose, the materials fall toward the lowest central point. As the cube is revolving, the falling occurs through the breaking away at the upper edges and a folding over on the lower material. None of the material is carried over by centrifugal force, but all falls in time to be shaken together with the mass as each corner reaches the lowest point. The fine and the coarse material cannot separate but are thoroughly intermixed and the discharged concrete is uniform. In a cube the angles joining the sides are in the line of motion of the material, hence are continually scoured and nothing can lodge. A little water thrown in at the close of the day's work, while the cube is revolving, cleanses it thoroughly. The cube never has to be pounded to keep it clean. It has no insides and has the cleanest discharge of any machine."

This machine is manufactured by the Municipal Engineering & Contracting Co., 607-611 Railway Exchange building, Chicago, Ill.

A LARGE AMOUNT of the copper annually mined is used in the manufacture of brass, the principal foundries and manufacturing establishments being in the Naugatuck valley, Conn. Brass is an alloy of copper and zinc.

smoke escaping through a tall stack.

At the Manzanita mine, in Sulphur creek, in Colusa county, Cal., an innovation in the reduction of quicksilver ores has been in successful operation for some time past. The ore is of the kind usually found in California mines, a metamorphic sandstone, impregnated with cinnabar, iron sulphide and other minerals commonly found in association in the quicksilver mines of the Pacific coast. The ore deposits occur at contact with the serpentine. The sandstone is for most part highly siliceous, and the mine during its early history was worked for gold. As the gold values decreased the cinnabar increased in amount, there always having been more or less of the mercury present in the vein material, until finally the values in quicksilver exceeded those in gold. At this time it was determined by the manager, Geo. V. Northey, who is also now the owner, to attempt to utilize the gold milling plant in the treatment of the ores for quicksilver. This plant consisted of a Gates rock crusher, a 5-foot Huntington mill, and several Gilpin County bumping tables arranged as shown in the accompanying sketch. Almost from the first success attended the efforts of Mr. Northey to concentrate cinnabar from these ores. As carried on at present, the rock from the mine is thrown over a grizzly and the oversize goes to the dump, containing usually too little cinnabar to pay. The ore passing the grizzly goes to the Gates breaker, which crushes it to sizes all smaller than a 1½-inch ring. From the breaker the ore is fed directly to the Huntington

nomina have been observed by Mr. Northey at the Manzanita mine, in the appearance of cinnabar on the faces of rock exposures in old workings where no cinnabar had been known to exist. Pieces of country rock which had fallen from the back of an abandoned drift were found in a few years to be covered with fine crystals of cinnabar, while the rock normally is entirely destitute of the mineral. In one instance a considerable area of rock on the side of an old drift was observed to be covered with an unusual gray efflorescence, such as is often observed on the surface of a damp drift, and which resembles mould in appearance. A careful examination of this material shows it to consist of cinnabar and some other minerals, the nature of which was not ascertained. The only rational theory to which these occurrences can be referred is the probable existence in the mine workings of minute quantities of mercury vapors, and also the presence of sulphuretted hydrogen—in fact, there is no doubt of the presence of the latter—and the formation of mercury sulphide which is precipitated under favorable conditions on the rock faces in the old tunnels and other workings of this mine.

BURRSTONES are made from a hard, siliceous rock, having cellular cavities. This is the typical millstone. Oolitic quartzite is sometimes used for this purpose. Grit is also extensively used for millstones. In fact, any stone which affords a rough surface and is sufficiently hard to wear well is suitable for millstones.

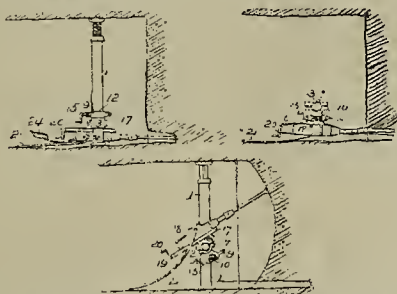


## Mining and Metallurgical Patents.

PATENTS ISSUED MAY 16, 1905.

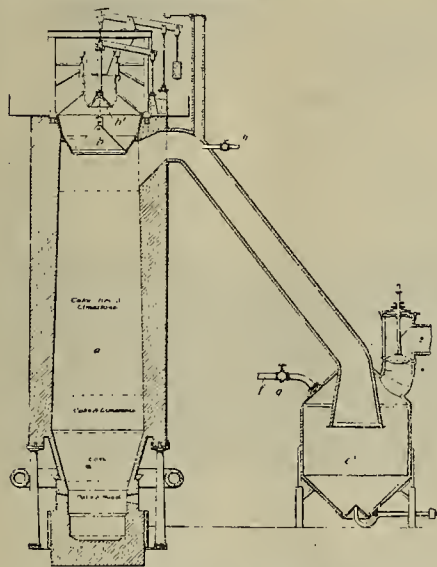
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ATTACHMENT FOR DRILLS.—No. 789,703; T. E. Adams, Cleveland, Ohio.



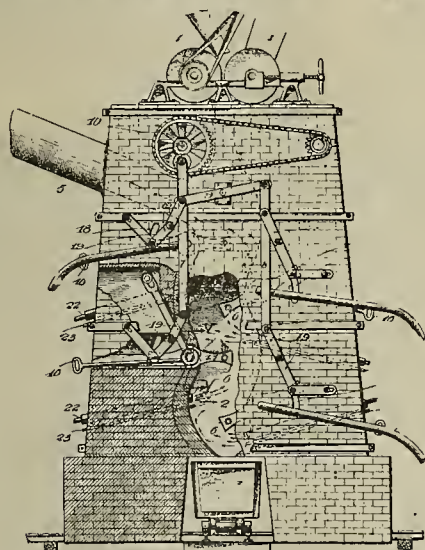
Drill attachment, comprising sleeve to be mounted on column, arm projecting at right angles to sleeve, drill support on arm, bracket on drill support, worm mounted in bracket, segmental gear and clamp for attaching gear to either column or arm and in mesh with worm.

ART OF CONTROLLING FURNACE GASES.—No. 789,844; J. W. Dougherty, Steelton, Pa.



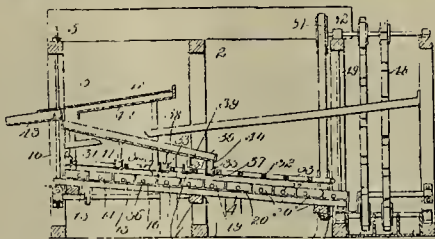
Art of controlling furnace gases, which consists in placing in front of gases emanating from furnace body of inert gas or vapor in sufficient quantity to prevent explosion.

PROCESS OF ROASTING ORES.—No. 789,952; J. A. Anker, J. H. Watson and P. Evans, Los Angeles, Cal.



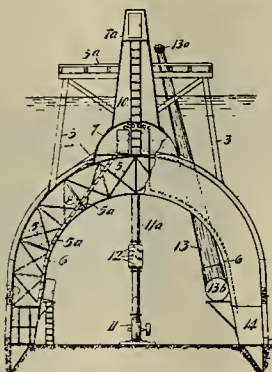
Process of roasting ore which consists of introducing separate flames into suitable chamber at various points, passing ore through furnace past flames, and alternately accumulating ore in heaps between flames and slowly dumping heaps to gradually deplete heaps and drop ore in several thin streams, respective streams being actively attacked by, and receiving intimate contact with, respective flames; and introducing air blasts into chamber simultaneously at various points to secure same chemical reaction upon all of heaps or streams of ore.

ORE CONCENTRATOR.—No. 790,156; W. M. Reely, Missoula, Mont.



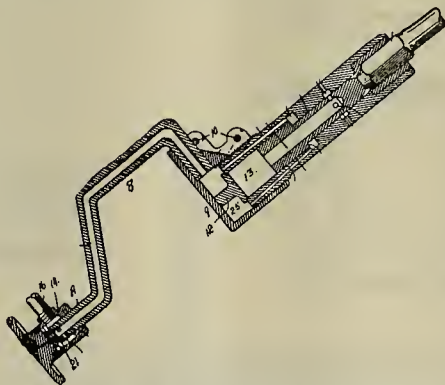
Concentrating apparatus involving reciprocatory and vertically adjustable inclined table provided with series of pans, series of sluiceways arranged at one side of and communicating with pans, pair of sluiceways arranged over table and communicating with plurality of pans at one end of series of pans, combined with means for feeding material to be concentrated to pans independent of plurality of pans, and means for transferring material conveyed by certain of sluiceways of series of sluiceways to the plurality of sluiceways.

SUBMARINE CAISSON AND TUNNEL CONSTRUCTION.—No. 790,046; P. J. Gildea, San Francisco, Cal.



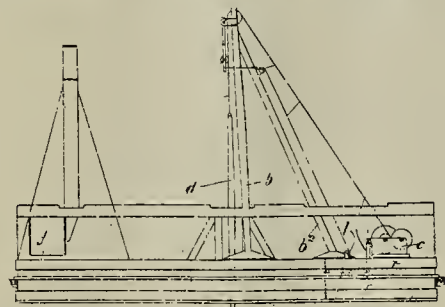
Caisson consisting of concentric arches with interposed air and ballast compartments, means for filling and discharging compartments, edge plates projecting downward from sides of caisson to form close joints with bottom, end gates fitted across caisson, means for hermetically sealing joints thereof, said means comprising flexible bags adapted to receive a fluid under pressure whereby they are expanded against joints, and caisson made capable of receiving air under pressure whereby water is expelled.

HAMMER DRILL.—No. 789,916; A. E. Johnson, Denver, Colo.



In hammer drill, combination with body of instrument and relatively stationary abutment, of hollow crank journaled in abutment at one extremity and connected with body of device at other extremity, and suitable means for introducing operating fluid to crank at its abutment extremity.

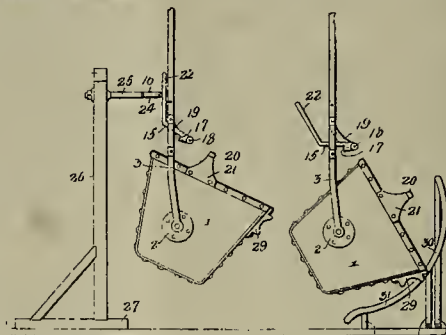
APPARATUS FOR BREAKING ROCKS UNDER WATER.—No. 789,981; F. Lobnitz, Renfrew, Scotland.



In rock cutting apparatus combination of cutter, hoisting winch, winding means connecting cutter with winch, sheer legs from which cutter is suspended, clutch on winch, means for operating clutch and device arranged on sheer legs for operating the cutter.

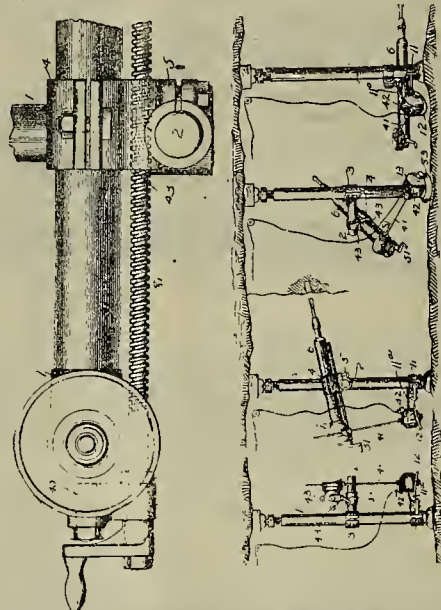
clutch-operating means whenever winding means slacken.

AUTOMATIC DUMPING AND CLOSING BUCKET FOR AERIAL TRAMWAYS.—No. 790,030; E. F. Crawford, Nelson, Canada.



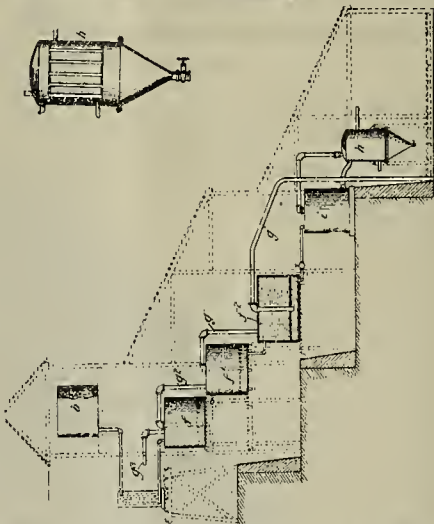
Combination of hanger or pendant, swinging bucket or container mounted eccentrically in hanger, lug carried by bucket, swinging latch mounted upon hanger and provided with shoulder adapted to engage lug to lock bucket in its upright position, and trip disposed in path of latch and having longitudinally extended portion.

ROCK DRILL.—No. 789,951; T. E. Adams, Cleveland, Ohio.



In drill, combination with adjustable support, longitudinally movable drill body mounted on support, and drill operating mechanism carried by drill body, of motor independent of drill body and mounted to rock, rigid drive rod extending from motor to drill operating mechanism, and means for maintaining respective bearings of drive rod in alignment with each other.

METHOD OF RECOVERING COPPER FROM ITS ORES.—No. 790,238; H. M. Wilcox, Chicago, Ill.



Process of recovering copper from its ores by wet way, which consists in leaching ore with suitable reagent to form cupric sulphate solution, blowing air through hot solution to remove iron or other impurities, dosing solution with sulphur dioxide to point of saturation, and thereafter, in closed vessel having proper vacant space left therein, subjecting solution to heat and pressure, suited for precipitation of copper in metallic form while sulphur dioxide is free to escape from liquid into confined space in such vessel provided, to perfect reaction.

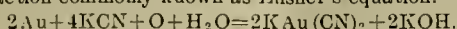


## The Cyanide Process.

Written by R. STUART BROWNE.

The following is from "Cyanide Plant Equipment," a trade treatise from the Redwood Manufacturers Co., San Francisco, Cal. In this article Mr. Browne, who is the company's engineer, has given in simple language a description of the cyanide process and attempted to make plain to non-technical readers some points governing the construction of cyanide plants. To those familiar with the process it presents no new features, but to many others it will prove of considerable interest:

The cyanide process is based on the fact that a dilute cyanide solution will dissolve gold in the presence of oxygen. This is explained in the following reaction commonly known as Ellsner's equation:



Briefly stated, the process consists in bringing an ore reduced to a suitable degree of fineness in contact with a cyanide solution; removing the solution from time to time as the gold and silver is dissolved, and replacing it with fresh solution; precipitating the gold and silver from the solution withdrawn; and, finally, subjecting the ore to a wash-water and then discharging it. The gold and silver is obtained in an impure state mixed with base metals, and these are removed by a simple refining process.

The cyanide process is a very flexible one. It may be used for the direct treatment of ores after crushing, or in connection with some other process such as amalgamation, concentration, etc. It is only directly applicable to the treatment of ores in which gold occurs in an extremely fine state of division. Coarse gold will dissolve in cyanide solution, but it may require a very long time to accomplish it. The process is, therefore, necessarily limited to the treatment of such ores as will yield a satisfactory extraction in a reasonable time. Fortunately, coarse gold may be removed by amalgamation, and if, after doing so, the tailings carry sufficient value, the cyanide process may be used for recovering the rest of it, or so much as is practicable.

Sulphide minerals, such as pyrite, yield up their gold to cyanide very slowly, so that when they are of sufficient value it is customary to remove them by concentration, and either treat them separately or ship to a smelter.

A certain class of ores require roasting to make them amenable, particularly those in which tellurides and arsenides occur. As a rule silver ores do not yield a high extraction, but by chloridizing them the silver is converted into a chloride, in which form it readily dissolves in cyanide.

Anything of an acid nature will decompose cyanide. Sulphides have a strong tendency to oxidize and form acid salts. These will react with cyanide and destroy it. It is, therefore, necessary to neutralize them by adding caustic soda or slaked lime to the ore, the amount being determined by means of the acidity test.

The fact that oxygen is necessary in order for the cyanide to dissolve gold has led to a number of patents being taken out for processes in which air or oxidizing compounds are either added or forced into the ore to increase the extraction. It is worthy of note that none of these processes have become very widely adopted, the reason being that if solutions are given sufficient exposure to the air they will absorb enough oxygen for the solution of the gold, and this without the heavy cost entailed by the use of expensive reagents and heavy installations of machinery. However, any method that will cheaply aerate the ore or solution is of great benefit in cyanide work.

We can divide the cyanide process into four operations: (1) Crushing the ore; (2) dissolving the gold and silver; (3) precipitation; (4) refining.

**CRUSHING THE ORE.**—The particular mill to be used for crushing will have to be determined by the character of the ore and the economic conditions. The selection of the proper mesh to crush through is one of the important details. It must be of such size that the gold, after passing through, will have been liberated from its matrix. Fine crushing gives a higher extraction than coarse crushing, but produces more slime. Slime is a product of crushing. It is material reduced to an impalpable powder, and which when wet becomes plastic. It is the most discouraging material that the cyanide operator has to handle, for it forms impervious layers in the tanks and prevents the solutions from passing through.

In dry crushing there is no tendency for the slime and sands to separate, consequently the material going to the leaching tanks, though it may contain considerable slime, will probably be sufficiently porous to percolate. Should, however, the pulp be mixed with a certain amount of water, the particles will be free to rearrange themselves, and will separate out in the order of their specific gravities. If all of the pulp is taken from a wet crushing mill and discharged into a tank the slime and sands will separate and arrange themselves in strata.

Such material cannot be treated. In all wet crushing mills it is, therefore, necessary to put in hydraulic classifiers, and separate the sands and slimes

and treat them separately. The cone classifiers, first introduced in the Black Hills, represent the latest improvement in this line. They are cheap, very simple, and work admirably. The pulp is taken from the plates or concentrators and discharged into the funnel of the classifier. The heavy sands sink down through a rising column of water and flow out at the bottom. The slime is carried up by the current and flows over at the top, and is conveyed to slime treatment tanks or else run to waste.

The sands discharged from the classifiers are taken to the automatic distributors over the leaching tanks. These revolve slowly under the action of the current and spread the sands evenly about the tank. It usually happens that some slime escapes the classifiers and is carried into the tank. To get rid of it, it is necessary to have the tank full of water while it is filling. The slimes are then held in suspension and are carried away by the overflow and caught in a circular launder built around the tank. The latest idea is to drain off the water through the bottom as fast as it runs in and keep the surface of the sands as dry as possible. This makes it possible to mix in some slime without danger of a separation of the two classes of material.

**DISSOLVING THE GOLD AND SILVER.**—A mill treating dry ore or tailings should be arranged differently from one treating wet material. The principal difference is in the arrangement of the pipe system and the sump and solution tanks. In a dry mill there are two solution tanks and the first solution run in is delivered below the filter bottom and allowed to rise up through the ore. A wet mill has no solution tanks, but a double sump system instead, and the solution is pumped on to the surface of the ore and allowed to percolate down. After the tank is filled with ore the cyanide solution is turned in and after becoming saturated it is allowed to stand for several hours and soak.

The precise method of treatment is variable, and the details—such as the strength and quantity of solution to use, the time of contact, and the order of applying the different washes and drawing them off—have to be worked out by experiments. The usual practice is to apply first a strong solution and follow with a weak one of half the strength of the first one; winding up with a water wash, after which the tank is discharged and a fresh charge put in.

**PRECIPITATION.**—The solution withdrawn from the leaching tanks contains the dissolved gold and silver. This may be recovered by any of the following methods: (1) Precipitation on zinc shavings; (2) precipitation by zinc dust; (3) precipitation by charcoal; (4) electrolysis.

Only the first method is used to any extent. It consists in passing the solution through a box filled with zinc shavings. As the solution runs through, the zinc dissolves and the gold and silver are precipitated as a fine powder. Fresh zinc is added once every twenty-four hours. The solution as it comes from the leaching tanks passes to the gold tanks. These are simply storage tanks, and though they are not absolutely necessary, it is convenient to have them. They serve to settle any sands which may have found their way through holes in the filter cloth, and also maintain an even pressure on the solution running through the precipitating boxes. The best way to draw the solution from these tanks is by means of a decantation pipe, or a flexible hose attached to an outlet in the bottom of the tank, and the inlet so fastened to a float that it is kept about an inch under the surface of the solution.

From the gold tanks the solution passes to the precipitating boxes, where, by means of baffle boards, it is caused to flow through the zinc. Here the gold is precipitated. In plants where gold tanks are not used the pipes carry the solution direct from the leaching tanks to the boxes. The solution, freed from its gold, passes to the sumps. In a wet crushing mill the solution is standardized; i. e., brought back to its original strength, in the sumps, and is then pumped back to the leaching tanks. In a dry crushing plant—and by dry crushing plant is meant any plant treating material that was originally dry or nearly dry—the solution passes from the sumps to the solution tanks, which are elevated above the leaching tanks, is standardized here and then comes back to the leaching tanks. All of the solution in the plant is saved and used over and over again. Occasionally the solution may become foul and very weak in cyanide, in which case it may be run to waste.

**REFINING.**—In the United States the precipitate is usually refined by the acid process. The precipitate taken from the zinc boxes contains in addition to the gold and silver, zinc, lead, copper and other metals. This material is put into a tank, and acid, either sulphuric or hydrochloric, is added. The acid treatment is kept up for some time until the base metals are dissolved and the bullion is quite pure. It is then washed with hot water by decantation and then filter-pressed or placed on a filter to get rid of the excess of water. The bullion is then dried in pans, after which the cake is broken up, fluxed, melted down in a crucible, and the bar made ready for shipment.

**THE ARRANGEMENT OF THE PLANT.**—In selecting a site for a cyanide plant it is of greatest importance to choose one with sufficient grade to permit of the

handling of the ore and solution by gravity. This of course is not always possible, so the tanks will have to be raised up on wooden structures. The foundations for these should always be built of concrete or masonry, preferably in the form of long walls. The initial cost of these is much greater than where the wood is used, but they generally prove cheaper in the end. A tank on a weak foundation is apt to move and serious leaks may occur in which the value of the solution lost will greatly exceed the cost of the most substantial masonry work.

If wooden sills are used, care must be taken to see that they are well set and are not placed where they will rot easily.

Cyanide plants may vary greatly in their appearance, but the underlying principles which govern their construction are the same. The leaching tanks are usually large and comparatively shallow. The height depends on the character of the ore. If the material to be leached is sandy and permits the solution to flow through it rapidly, it may be as much as 8 feet, while if it is slimy and retards the flow, it may be only 18 inches. It is not advisable to use tanks with a greater height than 8 feet, for the reason that the ore on the bottom will not yield a high extraction because of the failure of the oxygen to reach it. The tanks are usually made from 5 to 6 feet high and experience has shown that tanks of this size give the best results in both percolation and extraction.

Before ordering leaching tanks the ore should be examined and a tank selected in conformity with its character.

The side of the tank should always be straight, without any batter, and the hoops constructed of round iron, as this form is better able to withstand the corroding action of the cyanide solutions than any other kind. The hoops have only a small surface in contact with the wood, and they dry quickly and may be kept covered with a protective paint.

The number of leaching tanks in the plant depends upon the time of treatment. The time of treatment is reckoned from the time the ore enters the tank until it is sluiced out and the tank is ready for a fresh charge. A sufficient number of tanks should be provided so that one can be discharged every day. If the ore requires a six day's treatment then six tanks should be provided. The capacity of the plant refers to the amount of ore treated every twenty-four hours. If a plant contains six leaching tanks, each of 100 tons capacity, and a tank is discharged and filled each day, then that plant would be a 100-ton plant. If the plant discharged a tank only every day, it would be only a 50-ton mill. Leaching tanks, as well as all other plants used around the plant, should be set up off the ground so that every part of them can be readily examined for leaks. If properly set up on substantial foundations it is not likely that any leaks will occur; but it is best to be on the safe side and not take any chances. It is a good idea to give the tanks a couple of coats of P. & B., or if this is not done, to soak them for a few days with a strong alkaline solution, preferably one containing caustic soda.

The filter bottom is of very simple construction. A grating is laid and either nailed or screwed to the bottom of the tank to prevent it from floating. On top of this is laid either burlap or cocoa matting, and canvas on top of this. The under filter is put in simply as a support. To hold the canvas down on the sides a rope is driven down on top of it between the sides of the tank and the outer ring which encircles the grating.

If the ore is to be sluiced out, one or more discharge gates are put in. Beneath the filter is placed the various pipes with the necessary connections for either admitting or drawing off the solution.

The gold tanks are placed below the leaching tanks so that the solution can run into them by gravity. Sometimes for want of elevation they are dispensed with, but this will necessitate increasing the size of the sumps. Whenever possible they should be installed. These tanks need not be very large. The height is usually 5 or 6 feet. Two tanks are always used—one for weak and one for strong solution. These and all the other tanks should be constructed with vertical sides. They make a stronger and tighter tank than those constructed with a batter, and are much easier to set up. This is an important point in their favor, for in the remote mining districts to which these are shipped skilled labor is usually scarce and costly.

In some plants where the rate of percolation is very slow, montejus or vacuum tanks are used. These are large steel, air-tight drums connected by pipes to the bottom of the leaching tanks. A pump exhausts the air in the vacuum tank and the extra pressure created on the solution in the leaching tank brings on a more rapid percolation. Their action is intermittent. As soon as the vacuum tank is filled it must be emptied, and then the pump has to be started up again and the operation repeated. Gauges are attached to show the pressure within, and the amount of solution. The capacity of a monteju varies from two to four tons of solution. They are not often used, but when they are installed are of great assistance. They are placed above the gold tanks. By using two montejus in series the percolation may be made continuously, one monteju being emptied while the other is filling.

Below the gold tanks comes the precipitating de-



partment. A great many different opinions exist regarding the construction of the precipitating boxes. The ordinary type is a long, narrow box divided into a series of compartments and with baffle boards arranged to force the solution up through the zinc shavings. The dimensions of the compartments vary. The general opinion is that they should be narrow and deep rather than broad and shallow. Most cyanide operators prefer to have the solution flow up through the zinc rather than down. The former arrangement causes a maximum precipitation at the bottom of the compartment which tends to stop up the space under the screen with the precipitate and short zinc. With a down flow this is not so apt to occur. Another point in favor of the down flow is that there is less tendency for the zinc to rise when there is an excessive evolution of gas or during what is known as foaming, when the solution becomes excessively alkaline. With a box arranged for downward flow the progress of the precipitation can be studied better, since it takes place practically at the surface.

(TO BE CONTINUED.)

## Opal Mining in Australia.

Written for the MINING AND SCIENTIFIC PRESS by L. IRWELL, from information supplied by G. C. BERESFORD.

Superstitious associations and evil reputation have for many years prevented a full appreciation of the opal; but that exquisite, vari-colored gem, flashing with living fire, is now beginning to be appreciated as a jewel representing the various emotions of the human heart.

The opal district of New South Wales probably extends from latitude 22° to 32° S., and longitude 140° to 146° E. But the best known parts are situated across the Darling river and between the Bulloo and Paroo rivers in Queensland. Westward, on Cooper's creek, the country is said to be very rich; but as only a few of the most adventurous prospectors have ever been there, the probabilities are that nature will keep her treasures until some inventive genius discovers how to go and take them.

The town of White Cliffs is the center of the New South Wales opal fields, and from it, I believe, nearly all the opals in the world are supplied. The town is a remarkable combination of galvanized iron structures and tents. The former comprise the drinking saloons, the latter the residences of successful miners. The greater part of the population has only the brilliant constellations of the Southern Hemisphere for a roof.

The opal is found in parallel seams at various recognized depths from the surface to 40 feet; but the best gems are obtained on the 1-foot stratum, and, consequently, that level is more exploited than any other. The first operation is to sink a hole about 6 feet deep; then, if no opals have been met with, a rough windlass is erected, and the work of excavation is continued until a seam of opals is cut through or "bottom" (generally the 40-foot level) is reached. If no paying opals have been struck—opals of every color and shade abound everywhere, but those which have not the living fire of green or gold are considered valueless—the miner drives a drift along one of the levels in search of the elusive gem or sinks a shaft elsewhere. But miners are usually reluctant to leave any shaft that they themselves have dug, for they say that one stroke of the pick may lay bare a seam of "pin-fire" or break in two a rich band of "orange." These two varieties of the gem are readily sold to buyers on the field at prices ranging from (in American money) \$75 to \$150 per ounce.

When I visited White Cliffs I had a vague idea that the opal was a blue stone, but I knew nothing whatever of its nature or value or the method of finding it. Having had experience in gold mining, I knew how to secure my claim, and I eventually pegged out one adjoining that of a tall and lean Australian, who said his name was Daniel Crowder and that he had never yet struck a "pot"—that is, a rich find of opals. I labored manfully at my "hole," as Dan called it, and by the end of the first day had excavated 3 feet. On the second day I sent my pick crashing through a substance that rang like glass, and instinctively I knew that I had "struck it" in a double sense. Carefully I worked around the stuff and at length uncovered a layer of deep-blue shining stones which extended away into the side of my shaft. The sun was directly overhead and the temperature about 140°; but I did not feel the heat, for I believed that a fortune was within my grasp. I picked out slab after slab of the glistening stones and burrowed along horizontally. There appeared to be no end to the seam, and before long I had filled my bucket. I noticed that the stones had passed through a series of changes in color, a brilliant pink now taking the place of the former deep-blue tinge. But I did not notice that I was undermining the ground, and I only realized that all was not right when the walls fell in and almost buried me. Luckily, Dan heard my shout, ran to my assistance, and at last dug me out.

"How did you get under that?" he asked in surprise, as I wiped the earth from my eyes and ears. Filled with gratitude on account of my rescue, I answered:

"Dan, I believe there are tons of opals in there. I had filled my bucket and was digging for more when the ground collapsed."

"You filled a bucket?" he gasped.

"Yes."

"Then let me look at it," cried Dan, and, plying his shovel vigorously, in an incredibly short time he had thrown the earth from the fallen wall and had seized the bucket—what we usually call a "pail." Then the air was filled with true Australian bush poetry. When Dan had exhausted his stock of expletives, I asked him to tell me what was wrong. But the look which he gave me in reply instantly sent the temperature in my neighborhood down to zero.

"A bucketful! Tons of it! And I dugged your bucket out! If you weren't such a 'new chum' I'd make you eat the stuff."

"What do you mean, Dan?" I inquired, anxiously. "You haven't explained what's wrong."

"Wrong!" he exclaimed, scornfully. "That stuff's only 'potch,' and the whole lot isn't worth one drink."

"But—"

"Come with me," said he, "and I'll show you tons in my shaft. I'll give you all of it."

To say that I was surprised would be like saying that a temperature of 140° is warm: it is—exceptionally so. When I saw the glistening walls of Dan's shaft scintillating with color right down to the 40-foot level on which he was working, I felt anything but pleased. I soon resumed my labors, however, and kept hard at work for several days. Occasionally I cut through seams of opal matrix carrying stones of beautiful red tints, and others of a curious blend of almost all colors. For all the gems—as I thought that they were—Dan had only one contemptuous name, "potch," which is the miner's name for inferior opals, and, after hearing his verdict, I would go to work again sinking the shaft, my hopes sinking correspondingly.

One day Dan came to me in a fever of excitement, and, sliding down my windlass rope, he soon stood beside me.

"Do you know the nigger's claim?" he asked, abruptly, as soon as he got within earshot of me.

"Yes; it's three claims above mine," I answered.

"What about it?"

"Well," said Dan, "he's 'struck a pot.'"

"Of 'potch,' I suppose. There's plenty of that here."

"Oh, no. Fiery and green flashy stuff, worth £20 (\$100) an ounce, and the seam comes down this way, I think."

"Good luck to the nigger," I said. "If it comes our way, we'll have a chance of striking something better than 'potch.'"

"Yes," remarked Dan; "but don't you see that it may not come this way, and, if it doesn't, we won't stand any chance whatever unless you do the trick."

"What trick, Dan?"

"Can't you get down Black George's shaft, and, with some of your instruments, find out where it goes; and then you and I can go mates, peg out the ground and get down after it."

"Will he let us go down his shaft?" I asked.

"Certainly he will. Come along."

Feeling complimented at Dan's evident faith in my abilities, I went with him, taking in my hand a small spirit-level and a compass. We found Black George tolling at his windlass.

"We hear you've struck it," said Dan.

"You've heard too much, then," answered the dusky one. "I'd just found a few good-colored stones when the seam cut out again."

"It's cut out, has it?" roared Dan. "I think you're lying, because I saw you doing some staking yesterday. Where does it go, anyway?"

"Ah, Dan!" said the negro, with a laugh, "I wish I could find out. It goes somewhere, of course. Come down the shaft."

We at once accepted the invitation and followed him down the rope. Then, after lighting our candles, we crawled into his drive. Our progress was difficult, the drive being irregular and resembling in many respects the burrow of an animal. Dan struggled to find suitable words to express his opinion of George's unmethodical handiwork; but his efforts ceased suddenly, for the drive came to an end at a wall of flashing gems. They sparkled and shone in the candle light—a mass of translucent stones, blazing with that vivid fire that suggests diamonds, rubies and emeralds. I was speechless with astonishment, for it was the grandest display of gems in their natural state that I had ever seen. The seam which carried them, however, suddenly dipped at an acute angle and near the bottom of the wall disappeared entirely.

"Never mind, George," said Dan, as he viewed the apparently "cut-out" seam, "you've got enough opals on the surface there to keep you for the rest of your life."

"Can you make anything out of it?" he continued, addressing me.

"Oh, yes," I replied, using the level. "This seam evidently runs south from here and will probably reappear farther down the hill."

I knew that much from the fact that George had struck the lode at the 30-foot level, while Dan, farther down the hill and directly in the line of the reef, had already sunk his shaft 40 feet without finding any

trace of it. The angle of the dip showed clearly that the valuable opals were far under the workings of our claims; but I knew that, obeying its natural laws, the lode would turn and run up again, like the letter V, and at the same angle.

"It should be near the surface at our lowest boundary peg," I continued, making a mental calculation.

"Is that so?" cried Dan, in surprise.

"It's so," I answered. "I don't know much about opals at present, but I've studied geology a little."

"And does 'gology' tell you that?"

"It does."

"Then I'll shout for 'gology' whenever I see him," was Dan's reply.

"Better let us ascertain if it's correct first," I said, and, taking careful bearings, we ascended George's shaft, and, followed by the astonished negro, we proceeded down the hill.

"About here," I said at length; "the seam should be around this spot; but, of course, it will have turned to 'potch.'"

"Wait till we see," said Dan, smashing energetically at the ground with his pick.

"What was that?" he exclaimed, as a crashing sound followed his first stroke.

"Golly!" ejaculated George. "Let me try, Dan," and, throwing himself on the ground, he tore at the earth with his gouge (a diminutive pick).

Breathlessly we watched him, as with deft hands he threw the stones and gravel aside, and in a few moments there was exposed to our view a layer of opal formation that caused Dan to give vent to some tall words from sheer excitement. The opals were hidden by the white crust of matrix which surrounded them, and might have been mistaken for more of the hateful "potch" but for the piece which Dan's pick had shattered. The broken edges dispelled that idea, as quivering flashes of green and gold shot through its facets and the stone actually seemed to be endowed with life. We looked at each other. The find was a little within my claim, and what it might be worth was as yet a mere matter of guessing.

"My friends," I began, "the probabilities are that this formation extends farther, perhaps towards the west, so that—"

But my audience had gone. They had heard enough; and in fifteen minutes both Dan and George had pegged out new claims in the direct line of the seam, thus abandoning their old claims for the chances that might be in the new. They proved to be right, however, and within a very few days the ground was pegged out for miles around.

The great curse of the opal fields—the curse of most mining camps—is the drinking proclivities of the men; and, although flour and other necessities may sometimes be unobtainable during the dry season, liquor, such as it is, can always be had. To those who care to take it under the circumstances, it may be obtained gratis. Perhaps these somewhat curious circumstances need explanation, for they do not exist outside mining districts. When any man strikes a "pot," he at once sells all that he can easily uncover, and then visits the nearest saloon, where he throws the buyer's check on the bar and shouts for drinks for all comers. (I have never understood why he is in such a hurry or why he makes so much noise.) The news quickly spreads, and soon everybody knows that Sam Hilson has struck it and that free drinks are to be had at the Blue Ribbon, or some other saloon.

In the opal fields there are no labor disputes; every man works for himself. There are no capitalists in the opal-mining business at present. Some miners have a comrade to assist at the windlass, and many strange partnerships are formed for the purpose of working claims. I am sorry to say that miners who never drink more than is good for them are hard to find. The truth is that almost all opal miners have tried other occupations in which they have failed.

The day's work begins at about half-past 8 and is continued more or less industriously until half-past 11. At that time the man at the windlass boils the "billy" (a tin can used as a kettle), and then hauls up his perspiring mate from the candle-light gloom of the workings to the light of day. After eating, mining is resumed till 4 o'clock; but at that hour the opal seeker must cease his daily toil, or he will be forcibly assisted to do so by his indignant neighbors. A hasty meal is usually eaten at 5 o'clock. Saturdays and Sundays are given over to sports, washing—and drinking. Sometimes these days are also taken advantage of to prospect new ground; but, as nobody has yet been able to tell from surface indications what is the formation underneath, the miner often tosses up a coin and determines from its fall where next he will try his luck.

It is curious how the various races of humanity on the opal fields make certain lines of trade peculiarly their own. The camel drivers are all Afghans. The Chinese are well represented among the storekeepers. The bullock drivers are almost of any nationality. The saloon owners are chiefly English or Scotch. The lucky man, as far as successful mining is concerned, is not infrequently an Irishman, and the buyers are all Jews. They often retire from traveling after having made a few trips from Sydney or Melbourne to White Cliffs, and, judging from that fact and their well known characteristics, it is evi-



dent that they do well, even when nobody else does. I have journeyed far and have visited many gold fields in various parts of the world, but I have never visited a gold mining district where a man with no experience may be reasonably confident of at least earning a good living. This may be done on the opal fields of White Cliffs. Almost any man in good health can earn £5 (\$25) per week, and the chance is fairly good for making a small fortune, provided one stays long enough.

White Cliffs, although situated in New South Wales, is much more accessible from Adelaide (South Australia) than from Sydney, and is best reached by rail from the South Australian capital to the town of Broken Hill, and from there by mail coach to the opal fields, a distance of 180 miles. From the other capitals the route is by rail to Cobar, 500 miles west from Sydney. After leaving Cobar, the coach crosses the desert to the Darling river at Wilcannia, and from there another coach runs three times weekly over the remaining 70 miles to White Cliffs.

### Time of Setting of Cement.

The time in which cement will set is variable, and dependent on certain chemical conditions. R. C. Carpenter has given, in the Engineering News, some interesting facts concerning the addition of gypsum and chloride of lime to cement to effect its time of setting. In these experiments the time of initial set was taken in every case as the time when a pat of cement made with a certain percentage of water would bear a rod  $\frac{1}{2}$  inch in diameter carrying a weight of  $\frac{1}{2}$  pound. This method is a common one, but depends to no little extent on the judgment of the operator. It, however, gave results that were sufficiently accurate for purposes of comparison. These tests showed that with an addition of 1% sulphate of lime to the cement the maximum retarding effect was produced, and that beneficial result was obtained by the addition of a larger quantity. In this case, where the percentage of water was 22.1, the initial set commenced in 80 minutes and the final set in 157 minutes.

The cement, without the addition of the sulphate of lime, set very rapidly—the initial set commenced in 2 minutes and final set in 52 minutes. When the percentage sulphate of lime was increased from 1 to 7, the percentage of water being 25.4, the initial set occurred in 18 minutes and the final set in 59 minutes. With other kinds of cement previous experiments had shown that more sulphate of lime than this would have been required to produce the main effect. Other experiments showed that an addition of 2% to 4% of slaked lime to a cement containing a small percentage of sulphate of lime—which latter, through the influence of time, lost its effect in retarding setting—would restore the slow setting properties. Thus, with a cement containing 2% of sulphate of lime, the initial set commenced in 20 minutes and final set in 50 minutes; but with the same cement to which had been added 2% of lime the initial time of set was 6 hours and the final time 10 hours. Cement containing 1% of sulphate of lime, which had partially lost its effect, began to set in 10 minutes and set finally in 20 minutes, while with the same cement with 2% of lime added the initial time of setting was 1 hour and the time of final setting 8 hours.

It is considered that an addition of from 2% to 5% of slaked lime to cement containing sulphate of lime, but in which the latter had lost its effect, will be found useful in retarding the setting of the cement, and that the addition of the lime does not detract from the strength. The addition of slaked lime to cement to which no sulphate of lime has been added does not appear to have any effect on the setting. The investigations of E. Sandlot appear to show that the addition of a feeble solution of chloride of calcium to cement greatly retards the time of setting, but when the solution is concentrated—as, for instance, 100 to 400 grams per liter—it tends to increase the rapidity of setting. Kniskern and Gass of the Sibley laboratory experimented with different percentages of ground chloride of calcium mixed with cement clinker, which mixture they made into parts with just enough water to give the material sufficient consistency, and the results showed that the chloride of calcium was used. On account of the water required 1% of the chloride of calcium would correspond approximately to gauging with a solution of 30 grams per liter in the previous experiments quoted.

As far as the experiments show, it is considered by the author of the article that chloride of calcium added in small quantities has an important effect in extending the setting of Portland cement, and also that it does not have any injurious effect on the permanent strength and hardness. The chloride of calcium can be readily added by mixing it with the water used for gauging. Experiments indicate that the setting can be controlled by the addition of less than  $\frac{1}{2}$ %, which would be something less than 2 pounds to the barrel of cement. Experiments have not been made to show whether the chloride of calcium, if ground with the cement clinker, would have any detrimental effect.

### Mining in the Andes.\*

In the great mountain chain extending from Panama to Cape Horn, and called the Andes, are many great mineral veins and ore bodies. The natives, under the rule of the Incas, developed some of these mines, and Prescott tells of great amounts of gold turned over to the Spanish conquerors by Atahualpa, the unfortunate Inca, to secure his freedom, but which was denied him after the Spaniards had secured the gold. This gold probably came from the placers, as no extensive vein gold mines are mentioned by the chronicler, although silver mines are spoken of. There are gold mines in Panama and in Colombia, in Bolivia, Ecuador, Peru and Chile, and also silver mines, some of them among the most noted in the world. Copper is mined in all of these countries, but more particularly in Chile and Peru. Almost every department in Chile is the scene of copper producing industry. The department of Antofagasta is one of the most important copper producing sections in the world. Tocopilla is just north of Antofagasta, in the extreme northern part of Chile, and is also a copper producer of considerable note. The illustration on the front page gives a view of the port of Tocopilla, with its reduction works, steel piers and other evidences of industry. In the background rises the first range of the Andes mountains, which rise almost from the water's edge to a height of many thousands of feet. There are numerous mines in this front range, some of which are within sight of the city of Tocopilla, though many miles distant. The roads leading upward from the town can be faintly seen in the center and at the left of the picture. On the summit of the first mountain and immediately above the smelting works is the Dos de Mayo mine, and lower down on the slope and just over the outer edge of the pier is the Buena Vista mine. In the big canyon between the ranges at the left is the noted Feliciano mine. Neither of these mines are visible in the engraving, owing to the distance. The accompanying engraving shows the barren appearance of the country in the vicinity of the

I think the Standby and Caledonia mills were duplicates—both knee frame, the line shaft resting on the knees. They were supplied with friction clutches in place of tighteners for starting and stopping the cam shafts. The batteries in the De Smet mill were built in a double row of fifty stamps each, the plates facing each other and the ore bins built over the center of the mill, sloping from the center toward the walls. These bins gave large capacity, but the idea has not since been generally followed. J. F. SMITH.

Liscum, Ariz., May 20.

### THE PROSPECTOR.

The rock samples from Orsco, Or., are: No. 1, diabase; No. 2, diorite aphanite (fine grained diorite); No. 3, a dike rock which is somewhat silicified. Rock of this description is not of uncommon occurrence in mines and in many places forms a valuable ore, when carrying (usually) a large amount of sulphide minerals, pyrite, chalcocopyrite, etc. At such times the rock is usually siliceous. It is of common occurrence in some of the largest California gold mines. No. 4 is diabase porphyrite, but not typical, as the feldspar crystals are too small and indistinct. All of these rocks are often found associated with gold ores, and each of the above samples carry more or less sulphide of iron and copper.

The seven samples from Willcox, Ariz., are all essentially the same—a granular vein quartz, with more or less oxidized iron, copper and lead minerals. No. 1 is granular quartz, with massive and earthy limonite. No. 2 is essentially the same as No. 1, but contains, in addition to the limonite, a little bright red hematite, green copper carbonate and a small amount of lead carbonate. No. 3 is of the same character of vein quartz, but in this specimen the minerals are mostly unaltered, being pyrite, galena,



In the Andes Back of Tocopilla, Chile.

mines. This landscape, compared with that in any one of the mining districts of the State of Nevada, makes the latter look, by comparison, like a land of luxuriant vegetation. In the Chilean picture there is neither tree, grass nor shrub; nothing to greet the eye but the dull redish colors of miles of volcanic rock—andesite. In the left center of the picture the buildings at the Buena Vista mine may be seen, and on the mountain side above are some open workings. The Feliciano property is in the canyon in the center of the picture, but too distant to be seen.

\* See illustration on front page.

### The "A" Frame Battery.

TO THE EDITOR:—I read in the issue of the MINING AND SCIENTIFIC PRESS of April 22 a description of the "A" frame battery and some reference to its having been adopted in the Father De Smet mill at Central City, S. D. I made the drawings of the De Smet mill at Central City in 1878, following the suggestions of the superintendent, A. J. Bowie, and of I. M. West, the contractor, who afterward built the mill. These gentlemen went to San Francisco, Cal., taking the plans with them, and there some of the details of the plans were changed a little, probably at the Union Iron Works, as they made the machinery for the mill. Mr. A. J. Rigby was employed by Mr. West for a time on the mill construction, but he left after a short time to take the superintendency of the Caledonia mine. Mr. Rigby built the Caledonia mill of sixty stamps in 1879, and the Standby mill at Rochford, in Pennington county, also of sixty stamps, and also the hoisting plant at the Pierce mine, in Lead City, south of the Homestake. I worked on the drawings of all these structures with John Rigby, a son of A. J. Rigby, following the suggestions of the elder Rigby.

chalcocopyrite and zincblende. No. 4 shows granular quartz, green and blue copper carbonates, brown iron oxide (limonite), and a little pyrite. In No. 5 the carbonate of lead is more abundant than in any of the other samples. Carbonate of lime is also present as a result of infiltration from outside sources. Copper carbonate is also present in this specimen. No. 6 is about the same as No. 3, and No. 7 does not differ much from the others, but has more iron oxide and less lead carbonate than some of the others. The bright yellow mineral is sulphide, probably of iron and copper, and the color is due to tarnish. Neither gold nor any recognizable silver ore is observed in these specimens, though probably both are present. The rocks should be assayed. In depth the mine should make a good concentrating proposition.

The brown resinous mineral from Deep Creek, Utah, marked "F. L. W.," is garnet rock. The white crystallized mineral is calcite, which occurs abundantly throughout the specimens, being intermingled with the garnet in fine crystals.

The rock from Hayfork, Cal., is a granular quartz rock, stained red by iron oxide, and carrying patches of the black oxide of manganese.

The mineral sample from Bullfrog district, Nev., is chiefly chrysocolla (light bluish green) a silicate of copper. Some quartz is also seen in the specimens, and free gold is abundant. There is also present a few small yellowish scales which are probably embolite (chloro-bromide of silver).

The small crystals from Coffee, Trinity county, Cal., are quartz crystals and of no value, except as interesting specimens.



## Determination of Copper, Arsenic and Antimony in Lead Bullion.\*

Written by H. C. PARMELEE.

The methods set forth in the present paper involve no new points in analysis, but represent the adaptation of well known reactions, to meet special conditions. It is the custom of some lead smelters to require the determination of copper, arsenic and antimony on a sample of bullion representing the monthly output. This may be conveniently carried out as follows:

**SAMPLING.**—As the bullion is loaded for shipment, each bar is sampled in several places with a punch. These punched samples are subsequently remelted and cast into a bar about  $4 \times 12 \times \frac{1}{2}$  inches, this bar representing the carload. Samples weighing somewhat more than 1 A. T. are now punched from the bar for assay, and the clippings which the assayer discards in trimming his sample to weigh 1 A. T. are reserved. Finally the month's accumulation of these clippings is again melted, cast into a bar, and punch-sampled for the analysis. A thoroughly representative sample is thus obtained.

**THE ANALYSIS.**—Treat 10 g. of the sample in a No. 3 beaker with 50 c.c. dilute nitric acid (1-4). Dissolve the lead at a gentle heat and then evaporate down to incipient crystallization. Add 25 c.c. hot water, boil and filter while hot to avoid the crystallizing of any lead salt on the filter.

**RESIDUE.**—The substance on the filter contains almost all the antimony as insoluble oxides. Transfer this to a beaker with about 10 c.c. water. Add 2 c.c. HCl and 1 c.c. HNO<sub>3</sub>, and heat gently until the antimony is dissolved. Then filter through the original paper—wash thoroughly with hot water and evaporate to dryness, avoiding a temperature much in excess of 100° C. Redissolve with a solution of tartaric acid (1 g. in 10 c.c.) and a few drops of HCl. Boil and add to the original solution as indicated below.

**SOLUTION.**—This contains the copper, arsenic and traces of antimony, and should not amount to over 150 c.c. Add HCl in quantity calculated to precipitate the silver present, and sufficient H<sub>2</sub>SO<sub>4</sub> to precipitate the lead. Add immediately and with rapid stirring 50 c.c. alcohol. This will facilitate the rapid and compact settling of the precipitates which should be allowed to stand three hours. Filter under pressure on a Hirsch funnel or a Witte plate—decanting carefully. Wash by decantation three times with a solution of alcohol and HCl (4-1), finally throwing the entire precipitate on the filter and pumping dry. Boil the alcohol from the solution—reducing the volume to about 100 or 125 c.c.—and at this point add the solution of antimony as obtained above. Neutralize carefully with ammonia, add 2 c.c. HCl, bring the solution to boiling and pass H<sub>2</sub>S gas through the hot solution for forty-five minutes.

Filter off the sulphides and after washing transfer to the beaker, using the smallest possible quantity of water. Add 10 c.c. (2g.) KOH solution and heat until the arsenic and antimony are dissolved. Filter through the original paper and wash carefully, keeping the filtrate to about 40 c.c.

To the solution—containing the arsenic and antimony—add 1 g. KClO<sub>3</sub> and 50 c.c. HCl. Boil clear and filter. Make the filtrate ammoniacal, add about one-third of its volume of ammonia, and precipitate the arsenic with magnesia mixture. The arsenic is then determined in the usual manner.

The filtrate from the arsenic is boiled to expel the excess of ammonia, when a large excess (25 c.c.) HCl is added. Cool the solution, add an excess of KI and titrate the liberated iodine with sodium thiosulphate solution. If the same titrating solution is used as for the determination of copper by the iodide method, the calculation may be made on the basis of 126 Cu = 120 Sb.

Copper is determined in the residue insoluble in KOH solution, by oxidizing with HNO<sub>3</sub> and proceeding by the iodide method.

**CONCLUSIONS.**—Among the advantages which the foregoing offers, may be mentioned the ease with which a large bulk of lead is gotten rid of, the separation of practically all the antimony in the first operation, thus avoiding the possibility of retaining it in the lead precipitate, and the determination of all three elements on the same sample.

In the discussion which followed L. B. Skinner said: "In neutralizing by ammonia I think that the point should be brought out strongly that to neutralize the effects of the nitric acid on the subsequent hydrogen sulphide separation, the solution should be made quite strongly alkaline and boiled for several minutes."

"In the subiodide determination for copper this point is brought out by A. H. Low, i. e., that a boiling is necessary for some little time, and in a concentrated solution, to thoroughly neutralize the nitric acid, a mere neutralization with ammonia followed immediately by acidification not being thorough enough. The reason for this probably is that the metallic nitrates are not readily split up with other metals as well as copper. Regarding the leaching of



Windlassing on the Violet, Bonanza Creek, Klondike. (See Front Page.)

the sulphides (precipitated in an acid solution) by KOH I think the point should be brought out that this leach will dissolve some of the lead sulphide and a very small amount of the copper sulphide and the subsequent separations in this solution will be affected if the routine followed by Mr. Parmelee is adhered to, although the use of KOH is preferable to that of NaOH or the sulphides of ammonia, soda or potash, as its solvent action on the lead and copper sulphides is the least of any of the reagents mentioned.

"I have found that the amount of the KOH used should be held closely to the amount necessary to dissolve the arsenic and antimony sulphides, and I am of the opinion that the use of two grams is far in excess of the amount necessary for the arsenic and antimony content in the average lead bullion."

"Mr. Parmelee states: 'Add 10 c.c. (2 g.) KOH solution and heat until the arsenic and antimony are dissolved.' I would like to have him state how he determines the point at which heating is to stop. Or, what is his experience as to the length of time necessary to make a thorough leach?"

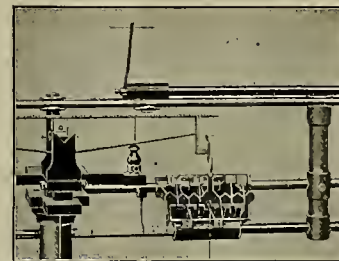
"I would like to ask if a precipitate is not formed upon the addition of ammonia before adding the magnesia mixture? In my experience there will be a gelatinous precipitate from impurities in the KOH itself and a precipitate of the lead which has been dissolved. Privately Mr. Parmelee advises that he always has found one and filtered it away. In the article the addition of the magnesia mixture is made directly after adding the ammonia without any intervening filtration. I have found that the lead here precipitated by ammonia or any iron that may have gotten into the KOH solution (and usually the ammonia precipitate shows some traces at least) carries down arseniates and antimonates. Now if this ppt. is not filtered away the magnesia precipitate is contaminated, and, if it is filtered away, it must be re-treated to recover arsenic and antimony. Regarding the determination of the copper in the residue, such a determination will not be total in case the KOH leach has dissolved appreciable quantities."

Mr. Parmelee replied that "the suggestions made by Mr. Skinner from his experience will no doubt add materially to the value of the scheme suggested, and it would probably be advantageous to incorporate them in the method. He has brought up a few points which had not occurred to me to investigate, but which at the same time can scarcely have any great effect on the commercial determination of the metals under consideration. The point regarding boiling with ammonia in order to thoroughly neutralize the nitric acid is acceptable. Referring to the leaching of the sulphides with KOH, it is possible that small quantities of copper may be dissolved, and it is certain that small quantities of lead are dissolved; but the question may well arise whether the copper dissolved by this solvent is sufficient to be estimated by the methods in common use. If not, and I believe not, then this error is one of the theoretical errors which are accepted in commercial work and not considered objectionable. The lead dissolved by KOH at this point will appear when the solution is made ammoniacal previous to adding the magnesia mixture for precipitation of the arsenic. It must here be filtered off, although I neglected to so state in the first paper. Here again the question will arise as to whether the quantities of arsenic and antimony carried down by the lead precipitate will be such as could be estimated by the usual methods or by Mr. Skinner's method. The lead precipitate is extremely small, and indeed will not always appear immediately on the addition of the ammonia, but only after five or ten minutes. Such a small precipitate would probably carry down only infinitesimal quantities of other metals. Regarding the time requisite for leaching the arsenic and antimony with KOH, will say that the appearance of the mixture is the first guide. There should be no indication of anything save a black precipitate and this should be boiled so that the KOH will thoroughly disintegrate

it. I can not state any exact time required, as the leaching was allowed a shorter or longer time according as other work permitted. After bringing the solution to a boil, however, it was usually allowed to stand on a warm part of the bath for thirty or forty minutes."

## Multiple Rider Carrier.

The accompanying illustration shows the multiple rider carrier for button balances, just placed on the market by William Ainsworth & Sons of Denver, Colo.



The weights or riders are each carried by an individual arm and should not become displaced except through gross carelessness. The arms are numbered on their front surfaces to correspond with the weight of the rider carried, and pivoted at the rear to swing clear of the comb-shaped bar below the stirrup. They are operated by a single rod with a thumb piece on the end of it extending through the case. When the arms are up, the riders are carried by them far enough above the comb-shaped bar to not interfere with the oscillations of the beam. In operating, the rod is moved to the right or left until the figure corresponding to the weight of the rider to be shifted stands opposite to the index pointer shown to the left of the frame carrying the arms; then given a slight turn and the arm carrying the rider is swung downward shifting it onto the comb-shaped bar. When the weighing is completed a glance at the figures on the arms that are down shows the combined weight of the riders on the bar. A slight turn of the rod resets all of the riders simultaneously. The manufacturers say that this carrier can be operated with speed and certainty, and the riders can be used for an indefinite length of time without perceptible change in weight.

**RAISING WATER** by means of the hydraulic ejector is not a new idea, for it has been in practical use for many years at a number of places. The largest installation of the kind is that at the C. & C. shaft on the Comstock Lode, Virginia City, Nev. There a plant of this character was installed in 1899 to unwater the Consolidated Virginia and neighboring mines below the level of the Sutro tunnel. At the time of this installation the only cheaply available power was a stream of water under 400-foot head at the collar of the shaft, which at the Sutro tunnel level was something more than 2000 feet. The elevator was a success from the start, but many changes in details were necessary before the plant operated satisfactorily. The water was lowered until a point considerably below the 2150 level of the California mine was reached, when a large plant of electrically driven pumps was put in at that level, and the ejector continued to drain deeper levels, it having now unwatered this and the neighboring mines below the 2350 level. At other places this method has worked satisfactorily and was installed by men of small means and little mechanical skill of a technical sort. In one instance a small stream was utilized under 600-foot head to raise water from a shaft 90 feet in depth. In this instance 9 inches of water were required to raise 3 inches from the shaft; that is, 9 inches were sent into the mine under this pressure to raise a total of 12 inches of water.

\* Jour. Western Chem. & Met.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

Although detailed statistics for the production of gold during the last year are not yet available, preliminary estimates of the production of each State and Territory show that the production of gold in the United States during 1904 amounted to \$84,551,300. After a period of very rapid advance in the gold production from 1892 to 1900, inclusive, during which an increase from \$33,000,000 to \$79,000,000 took place, there were two years of nearly stationary output and one year of decided decrease. It is, therefore, satisfactory to find that the production of the yellow metal has risen again to record figures, the estimate being \$84,551,300, against \$73,591,700 for 1903. Lindgren finds that the sources of this increase are easily traceable. In the first place, Cripple Creek, the greatest gold mining camp of the United States, has gained about \$3,000,000, due to renewed mining activity following the successful completion of a new drainage tunnel, the cessation of the strike which interfered with the production of 1903, and new discoveries of rich ore bodies. In the second place, Goldfield, Nev., during the first year of its existence, added at least \$1,500,000 to the value of the output of that State. In the third place, the production of California has risen nearly \$3,000,000 compared with the production of 1903. This increase is due in considerable degree to the development of the dredging industry in the Sacramento valley. Lastly, the smelting of auriferous copper ores has received a great impetus in Utah, augmenting the gold output in that State by \$1,000,000. These four factors, together with the moderate gains in the production of Alaska, Montana and South Dakota, are sufficient to account for the increase of nearly \$11,000,000 in the production of the last year compared with that of 1903. Lindgren classifies the gold production according to its derivation from placers, dry or quartzose ores, copper ores and lead ores. He estimates the production of gold from placers as \$12,000,000, from quartzose gold and silver ores at \$62,754,000, from copper ores at \$4,300,000 and from lead ores at \$4,600,000, making a total production of \$84,551,000—a sum that practically agrees with the estimate of the Director of the Mint. Alaska is the largest producer of placer gold and should show a gain of at least \$200,000, the output being estimated at \$5,800,000. California will show an increase which may reach \$800,000, the production being estimated at \$4,800,000. This is partly due to a favorable season for hydraulic mining, but chiefly to the great development of the dredging industry. Unexpectedly large areas in Yuba, Sutter, Nevada, Butte and Sacramento counties have proved suitable for the dredging process, while the dredging machines have been greatly improved and enlarged and the expenses correspondingly reduced. At the same time the output due to drift mining and hydraulic mining is on the whole slowly decreasing. Idaho, Montana, Colorado and Oregon have probably maintained their production at the value reached for a great number of years. During 1903 these States, respectively, yielded \$750,000, \$482,000, \$400,000 and \$207,000. Since 1902 New Mexico has contributed over \$100,000 annually in placer gold, derived from veins of unknown age and obtained by dredging operations in Colfax county, but none among the other States has exceeded \$100,000 in output. The production of gold from quartzose gold and silver ores is subdivided by Lindgren into the production of pre-Cambrian quartz veins, \$5,454,000; of Mesozoic quartz veins in the Pacific coast belt, \$21,600,000; and of Tertiary gold quartz veins in the Rocky mountains and Great Basin, \$35,700,000, making a total of \$62,754,000. Auriferous quartz veins of pre-Cambrian age are, so far as known, confined to the Atlantic States, South Dakota and Wyoming. The bulk of the yield from the Atlantic States comes from North Carolina, South Carolina and Georgia and is derived from gold-bearing pyrites. In South Dakota the great low-grade deposit of the Homestake mine is considered to be of pre-Cambrian age. The small production of Wyoming should probably also be credited to the same class of deposits. Auriferous copper ores occur throughout the United States in deposits of widely differing age and form. Some of the greatest copper deposits, however, such as those of Arizona and Michigan, are practically free from gold. The gold from California's copper deposits is estimated at \$272,000 and from Montana's copper ores at approximately \$1,100,000. The mining of auriferous copper ores in Oregon has received a great impetus during recent years, and the production of gold from this source has steadily increased. It is estimated at \$2,100,000 for 1904, but this includes some of the smelting ores from Tintic, which are apt to contain both copper and lead. The gold from copper ores in Colorado is difficult to estimate, as no exact statistics are available, but it probably does not amount to \$500,000. From Colorado and Utah come the principal gold-bearing lead ores. Colorado contributes about \$4,000,000 of gold from its lead ores, one-fourth of which is derived from the Leadville mines. Utah gains about \$400,000 of gold from lead ores, nearly the entire amount of which is obtained from the Park City silver-lead veins.

The general conditions of copper mining in the United States are discussed in a recent bulletin of the United States Geological Survey. The United States supplies about 60% of the entire copper product of the world. The value of the output of copper for 1904, which is estimated at \$95,000,000, exceeds that of gold and is surpassed only by that of coal and iron. Of this production about two-thirds was exported in 1904. Our imports are practically all from Mexico and Canada. The profit of copper mining is shown by the fact that seventeen copper companies declared dividends during 1904 that aggregated \$26,161,000. This is indeed a favorable showing when compared with the dividends of the seventy-seven gold, silver and lead companies, including the smelting trust, which amounted in all to \$19,106,000. It is estimated that the production for 1904 exceeded that

of 1903 by about 8.6%, amounting approximately to 783,000,000 pounds. This increase is due mainly to Arizona mines, but the tremendous development in Utah, notably at Bingham and in the Frisco district, indicates that this State will soon take a more prominent place as a copper producer. When carefully studied, the figures show that the Lake Superior district maintains its relative part of the average increase in the production and consumption of copper, that the same is true of the Montana mines, and that the Arizona mines will show a still greater increase and are likely in the near future to take the lead in the world's production. At the present time the Boston and Montana mines of Butte are the greatest producers in the world. After them in productiveness come the Anaconda, Lake Superior and Rio Tinto mines, named in the order of their importance. The copper deposits of the United States are remarkable not only for their size and productiveness, but also for the variety of their ores. The important copper deposits of other countries consist of chalcopryite, while in the United States ores of this character form a relatively small part of the total output. In a general way each of the great copper producing districts of the country is distinguished by a characteristic ore. In Michigan it is native copper; in Montana, chalcocite or enargite; in Arizona it is largely copper oxides and carbonates; in Tennessee and California, chalcopryite; in Colorado, tetrahedrite.

### ALASKA.

A recent publication of the United States Geological Survey in describing the Ketchikan mining district says that copper appears to be the most important metal of this district, gold and silver being next in consequence. The copper is confined chiefly to Prince of Wales island, which forms the western half of the Ketchikan district. The bedrocks of the island are argillites and white limestones, associated with greenstones. As the result of metamorphism the limestones have been changed to marble, the greenstones to schists, and the argillites to crystalline schists and graphitic shales. Intruding these older strata are masses of quartz-diorite occurring as stocks miles in width, together with dikes and small areas composed of a more basic rock. On the east side of the island from Chomondeley sound northward, including Kasaan peninsula and the west side of Cleveland peninsula, the Kasaan greenstone forms the country rock. Niblack harbor forms an indentation in the shore of Prince of Wales island, and is 36 miles by water from Ketchikan. The mountains rise with steep ascent from the water's edge to peaks 2000 to 3000 feet in elevation. Greenstone is the country rock in the vicinity of the mines, but this, in places, has been altered to sericite, chlorite and amphibole-schists. The ore bodies occur both as small and irregular veins and as mineralized zones. Though the veins are rich in values they will never be of as great importance as the extensive mineralized zones. Chalcopryite, with pyrite and pyrrhotite, carrying gold values, are the principal ores. Developments during the past two years have been confined to ore bodies exposed on the Judge claim, at the head of Niblack anchorage. On the original locations of the Lookout group, situated at an elevation of 1500 feet, on the south slope of Niblack anchorage, only the annual assessment work is being done. The deposits at the Judge claim are large lenticular masses from 10 to 100 feet in width and 100 to several hundred feet in length and depth. These are separated by unmineralized belts of greenstone-schist. The ore—essentially a massive sulphide of pyrite and chalcopryite—occurs in a matrix of altered greenstone, and appears to fill sheared zones, as both masses and fragments of the greenstone occur, completely surrounded by the mineral. Small veinlets of sulphide, associated with quartz, occur in parts of the workings and form what is locally termed a Jasper ore. The developments at Niblack anchorage consist of an inclined shaft 180 feet deep and, leading from this at three different levels, 660 feet of drifting and crosscutting. The ore is said to carry 5% copper and \$1.50 to \$2 in gold values. Concentration of this ore would not be practicable, owing to its massive state and the high percentage of valueless iron pyrite, which can not be separated from it except by smelting or some process of solution and reprecipitation. The mine is favorably situated and the ore from the shaft may be transported in cars to scows or barges for shipment to the smelters. A water power at the head of the anchorage is controlled by the company and can be used to develop enough electric power for mining purposes. On the northeast side of Kasaan peninsula seven claims of the Brown Alaska Co. are extensively developed. The country rock near Hadley, as well as of the greater part of the peninsula, is composed of the Kasaan greenstone with occasional intervening beds of much wrinkled limestone altered to marble. Interstratified in the limestones are beds of magnetite, often carrying chalcopryite. Dikes of felsite and more basic rocks are intruded into both the greenstone and the sedimentary beds. The general trend of the sedimentaries is north-south, and the dip is to the west. The deposits form irregular lenses, generally concordant with the dip and strike of the formations, and seven such masses have thus far been discovered, varying from 100 to 150 feet in length and 20 to 40 feet in width. The ore, essentially chalcopryite, is said to contain 3.5% to 4.5% copper, with \$1 to \$2 in gold values. Two shafts, 40 and 80 feet deep, and three tunnels, from 100 to 200 feet in length, with many drift tunnels, expose the deposits at various elevations. On the surface a 500-ton smelter has been put up, also a compressor plant. On the southwest side of the peninsula the Mount Andrew copper deposits have the same manner of occurrence. A tunnel, 800 feet long, has been driven. The Copper Mountain-Sulzer properties are on the south side of Hetta inlet, in the southwest coast of Prince of Wales island. The ore occurrences in this area, though rather widely scattered, are all of copper, with a few dollars per ton in gold values. The ores are found principally along the contacts of a limestone, with either granite belts or diabase dikes. The original ores are principally chalcopryite, pyrite, pyrrhotite and magnetite, with quartz, calcite, garnet and epidote as gangue minerals. In many of the deposits surface oxidation has altered the sulphides to a considerable depth and formed carbonate and oxide ores. At the Alaska C. Co.'s prop-

erty, on the south slope of Copper mountain, development follows a contact of granite with limestone and shows the usual contact phenomena. The ledge, known as the New York, at an elevation of 3300 feet near the summit of a steep mountain slope, is exposed by large open cuts and short tunnels. At 2400 feet elevation a tunnel, 1400 feet in length, is being driven to undercut the ledge below the surface workings. A 250-ton smelter has been completed, a water power plant sufficient for all purposes has been built, besides a 5000-foot cable tram from the uppermost workings to the smelter. Two large groups of claims are being developed by the Alaska Industrial Co., namely, the Jumbo group of twenty-nine patented claims, on the north slope of Copper mountain, and the Green Monster group, 6 miles east of Copper mountain. On each of the above groups several copper-bearing ledges have been exposed by tunnels and open cuts, and on some there are large surface exposures of rich chalcopryite ore. On the Jumbo claims diabase and limestone are in most cases the enclosing rock. At the Green Monster group the deposits are more often at or near the granite limestone contact.

S. Peacock, manager of the Omar M. Co., is working the Kayram mine, Ketchikan district, with thirty men, and by July 1 his force will be increased to eighty men. W. P. Wood is engineer and J. McCallion foreman. The first work will be the construction of a mile-length tramway, connecting the wharf at the east level with the works 3300 feet above that elevation.—A. A. Wakefield has commenced work on his property adjoining the Niblack copper mine, Ketchikan. It is the intention to sink a new shaft, from which the ore body will be thoroughly explored by drifts.—The contract of the Niblack management, Ketchikan district, calls for the delivery of 50,000 tons of ore to the Tacoma smelter this season. The first shipment of this has already been made, and it is expected that several of the steamers on their down voyages will carry Niblack ores. The rate of shipment at first is expected to be about 5000 tons a month, but will increase as underground explorations are extended.

A Tacoma report says that mining operators in the Nome district, who are assembling cargoes of machinery for shipment north, say that 1000 more workmen than are now at Nome will be required in the adjacent districts during the coming summer.—J. E. Chilberg of the Pioneer M. Co. says there are five ditches to be built in the Kougark country.—W. E. Leland of California, who represents Los Angeles capital, will take north 1000 tons of machinery for use in the Solomon bay district, including a large dredger. Materials to be shipped north by the first boat will include the rails and equipment for 30 miles of railroad from Mary's creek to Davis Landing.—Navigation has been opened between Dawson and Fairbanks.—Citizens of Fairbanks are reported to have organized a vigilance committee to rid the town of desperate characters.

To open up the Copper River valley, reduce transportation rates and develop the copper and coal mines of Alaska, the Copper River & Northwestern Railway Co. has been organized in Seattle, Wash., with J. Rosene, M. Thomsen, D. H. Jarvis, J. D. Trenholme and H. Bratnoher as the board of directors. J. Rosene says that the road will run from Valdez to the Copper river and will probably be extended to Eagle. H. Deyo, chief engineer, and four assistants have been in the North since April, making surveys and mapping out a route for the new road.

### ARIZONA.

Cochise County.

(Special Correspondence).—The Vantia M. Co., operating near Benson, are putting in a new stamp mill, pump and motor. The mill will have fifteen tons daily capacity, being of the circular screen type with triple discharge and the stamps weigh 900 pounds each.—The Savage G. M. Co., operating in the Paradise district near Rodeo have purchased a 50-ton smelter which they will put in on their property. Besides smelting the Savage ores it is the intention of the company to do general custom work for the mines of the Paradise district. Benson, May 23.

The Warren district, surrounding Bisbee, is in the Mule Pass mountains near the Mexican line. This range runs east and west and consists of beds of Lower Carboniferous limestone dipping away from a central mass of porphyritic rock. The ores are found in the erosion canyons on the south side near the contact of the limestone and porphyry and formed by the replacement of the porphyry through mineral solutions. The sulphides pass in alteration into bodies of oxidized ore. Empty caves are usually found above the ore.

The Cochise Cons. Copper Co. is to put in a large concentrator at Douglas.

Gila County.

(Special Correspondence).—The Warren Copper Co. are preparing to sink a 500-foot shaft near Globe.—The owners of the United States group are preparing to start work near Globe.—A new hoist is to be put on the Gibson mine, near Globe, to sink another shaft. It is shipping 250 tons copper ore monthly. Globe, May 23.

The Arizona-Colorado Copper Belt & Gold M. & M. Co. has resumed work, 3 miles north of Globe, with eighteen men under the direction of J. Bandhauer, superintendent. A No. 7 Cameron station pump has been put in at the 200-foot level, also a blowing apparatus, and the plant has been overhauled preparatory to sinking. Work has been started in the double-compartment shaft, which will be sunk 300 feet deeper, giving a total depth of 500 feet. R. M. Forsee has been re-elected president and general manager.

Graham County.

It is announced that the Shannon Copper Co., at Clifton, will put in a new converting plant and add another smelting furnace.—F. M. Morris has shipped rich ore to the Shannon smelter from near York.—The Arizona Copper Co. is putting in a briquetting plant at Clifton to save the fines of coal and coke, mixing with pitch and compressing.

Maricopa County.

L. White reports that the work in the White gold



mine has been temporarily stopped pending the arrival of a hoist and the hauling of the tramway.

#### Mohave County.

(Special Correspondence).—The Cyclopic G. M. Co., in Gold Roads, has completed a wagon road from the mine to a connection with the Dolan Springs road, which shortens the distance to the railroad 22 miles. The company has laid a new pipe line to the springs and has put in a pumping plant to force the water over the mountain to the mill. The milling plant has been remodeled and the crushing of ore will soon be started. A hoisting plant will be started. Rich ore is reported from the Red Top mines, Weaver district.

Kingman, May 23.

The Elkhart mine at Chloride is being unwatered preparatory to sinking the 600-foot shaft. High-grade shipping ore has been struck in the lower workings of the Jersey Lily mine at Chloride. Superintendent T. B. Lamb will make a trial shipment to El Paso. The new mill belonging to the German-American M. Co. at Snowball has arrived and by July 1 is expected to be ready for work.

#### Pinal County.

The Midway mine has been taken over by Pittsburg capitalists and 300 feet of track and a car have been ordered for work in the lower levels. This mine is 1½ mile from Kelvin, on the south side of the river. An engine and boiler for the leaching plant is to be put up on the Gila river, 9 miles from Florence. The Eldermemania properties, between Ray and Kelvin, have been bonded to parties who will develop them. Manager Sharpe, of the Arizona-Pacific, reports that he has unwatered the mine at Woolley and resumed sinking.

#### Santa Cruz County.

The Springfield-Arizona Development Co., E. G. Mallette manager, is preparing to work properties near Harshaw. The Presidential mines, in the Santa Rita mountains, are putting in pumps and boilers.

#### Yavapai County.

(Special Correspondence).—The Arizona Smelting Co. has purchased of the Bradshaw Mountain C. M. & S. Co. the Val Verde smelter on the Agua Fria, south of Prescott. The main consideration is the assumption of a mortgage for \$35,000, held by the Commercial Trust Co. of Phoenix. This is the first step of the new company toward rebuilding the Val Verde smelter, the loss of which has been a hardship to miners in Yavapai county since its destruction by fire less than a year ago. The Arizona Smelting Co. has capital and will doubtless erect a modern smelter. The Geo. A. Treadwell M. Co.'s 250-ton smelting plant at Mayer is ready to blow in. It has been built for treating the ores of the company's own mines, but custom ores will be received. The company's mines, known as the Hackberry, Iron Queen and Boggs, have 10,000 feet of workings and are developed to depths of from 400 to 500 feet. They are said to be in condition to produce daily upward of 200 tons of ore carrying average values of 4% copper. Near the smelter and on the company's ground is a deposit of lime which will be used for fluxing purposes. The grade of matte turned out will be between 30% and 35%.

Prescott, May 23.

The Thumb Butte M. Co. has started work near Prescott. It is reported that they will put up a mill. A. J. Harris is putting up a new cyanide plant at the Harqua Hala mine.

It is reported that on May 22 tons of rock and earth caved in at W. A. Clark's United Verde copper mine at Jerome, the ground dropping from the surface to the 700-foot level. Cracking timbers gave the alarm and 300 miners escaped uninjured. For several days the ground had been settling and the timbers creaked. From fissures on the surface clouds of sulphur smoke arose from that part of the mine which has been on fire for several years. The extent of the damage has not yet been ascertained. The hoisting works, which are over the mine, have settled and the machinery cannot be worked. The smelting plant has also been shut down and all activity has ceased.

The Mudhole mine, on Lynx creek, southeast of Prescott, is to be reopened by the new owners. The Decatur mine, near Jerome, is being worked again.

### CALIFORNIA.

#### Amador County.

The Central Eureka shaft, near Sutter Creek, has been completed to a depth of 2400 feet, where a level is being opened up. This company has declared a May dividend of 7 cents per share, making \$28,000 in all.

#### Mono County.

Active work is reported from Masonic, near Bodie. The shaft on the Jump-Up-Joe is down 85 feet. Work has commenced on the True Friend group, under the management of F. Stewart, who will run a 100-foot tunnel to tap the ledge. On the Myrtle & Julia a shaft has been sunk 50 feet. A stage, to run tri-weekly, will be put on by H. H. Boone of Bodie, as soon as the roads are passable.

#### Nevada County.

The new 5-stamp mill at the Kenosha, formerly the Seven-Thirty mine, near Grass Valley, will soon be ready for operations. Sinking is under way. The Oustomah M. Co. of Nevada City has bought land on Wet hill, which will enable the Oustomah to drift north along the course of their vein. The Idaho-Maryland twenty stamps are crushing rock from the dump. The Orleans mine near Grass Valley has been sold to J. M. O'Brien of San Francisco, Cal.

#### Plumas County.

The main tunnel of the Lawton mine, south of Quincy, is to be driven ahead, under the direction of O. Jones.

#### Shasta County.

H. O. Cummins of Shasta is putting up a 5-stamp mill for the Middle Creek G. M. Co. at the Dobrowsky mines. The National mine on Rich gulch, near Churntown, 10 miles from Redding, is under the management of H. P. Walker.

#### Sierra County.

F. L. Taft and Wm. Daxon of Mullan, Idaho, have

started work at the Sovereign mine in Ladies canyon, near Sierraville.

Work has been started at the Diadem mine, near Forest. The drain tunnel is being repaired and pumping will be started.

#### Siskiyou County.

F. C. Perew of Los Angeles has taken an option for \$200,000 on the Taylor Lake M. Co.'s claims in the Liberty mining district, 12 miles from Etna. He expects to add more stamps to the mill and to put in an electric power plant. The Blue Jeans M. & M. Co., operating on China gulch, Liberty mining district, are crushing ore in a 2-stamp mill. J. M. Hadley, Wm. Werst and B. S. Phillips are interested.

#### Tuolumne County.

The New Calico M. Co. have started their hoist on the Lucio ranch east of Stent. J. A. Thompson is manager, J. H. Gerken superintendent, J. J. Morris foreman and A. W. Young and G. Hepper engineers. The shaft is down 140 feet vertically. The Densmore mine, near Columbia, has been bonded to H. Dible and associates for \$100,000. Work is to be started at once. The main shaft on the Don Pedro, near Cooperstown, is down 200 feet, where a station has been cut and drifting started. It is reported that a 10-stamp mill is to be put up. W. H. McClintock is superintendent. The main three-compartment shaft of the Omega, near Columbia, is down 90 feet. Work is to be resumed on the Mack near Big Oak Flat. The Santa Ysabel shaft near Stent is to be sunk 300 feet from the 800-foot level. The mill has been started on the Brindle Pup near Columbia. Crushing has been started at the 3-stamp mill of the Experimental Gulch mine near Columbia. New concentrators are being put in at the Longfellow mine near Big Oak Flat.

#### Yuba County.

The U. S. Debris Commission has secured complete rights of way for the system of training walls from Daguerre point to Marysville, and the walls will be built this year to correct the channel of Yuba river and cause it to scour and reduce its level. The walls will be built by mining dredgers without cost to the Government, the owners of the machines extracting gold from the material while building the walls.

### COLORADO.

(Special Correspondence).—The Independent smelter operating at Golden has been closed down for some time on account of shortage of ore. At a meeting held the latter part of last week it was decided to reopen the smelter. The operators in Clear Creek and Gilpin counties have agreed to throw their patronage to the Independent plant. The smelter which has a capacity of 300 tons per day has been operating only a portion of the plant and it was decided to close down until some definite arrangements could be made to secure the proper amount of ore. The United States Mint, which was to have opened July 1 for coinage purposes, will be delayed opening on account of some changes having to be made in the plant. The Gore canyon suit of the United States Government against the Moffat railroad for right of way through the canyon is attracting the attention of the State as it may involve their rights to the use of water as well as the canyon. The Denver Chamber of Commerce is probing the freight rate question and have a representative before the Senate Interstate Commerce Commission in Washington setting forth its complaint along this line. It is thought by getting the freight rates reduced to an equal footing with Eastern point, it will be a great benefit to Denver and Colorado.

Denver, May 23.

#### Clear Creek County.

The Wilcox tunnel at Silver Plume, which is being driven by the Waldorf Co. to develop their claims, has cut the Commonwealth vein, which is an extension of the Santiago lode owned by the Hazelton-Santiago Co. As soon as the new compressor is put in drifting on the vein will be commenced. The Commonwealth vein has been cut 3800 feet from the portal of the tunnel. It is reported that the Transcontinental M. Co. will put in an air compressor to drive the Vidler tunnel in East Argentine district.

Work is to be resumed on the Mammoth property on Brown mountain near Georgetown under the superintendence of B. J. O'Connell. The crosscut tunnel being driven into Leavenworth mountain near Georgetown by the Leavenworth Mountain M. Co. is in 110 feet. R. H. Blackman is manager.

A 25-ton mill is to be put in at the Santiago in the Argentine district, water being obtained from Georgetown.

#### Eagle County.

A strike of high-grade ore is reported near Pando, south of Red Cliff. Claims have been staked around the discovery.

#### Gilpin County.

J. F. Hopkins of Denver has given a lease and option on the New York stamp mill on North Clear creek to the Pewabic Con. G. M. Co. Men have been put to work and the mill will be in charge of C. Fox. The mines of the Pewabic Co. in Russell district are reported to be in good shape for furnishing the bulk of the ore supply for the mill. Chicago parties have taken a lease and bond on the Mabel property in lower Russell district, owned by C. F. Barker of Hot Sulphur Springs. T. Cudahy of Central City has been appointed manager. The group is developed by a tunnel which is in 900 feet, and which cuts the main shaft of the group, which is 250 feet deep from the surface to the tunnel and goes down a further depth of 162 feet below the tunnel. This shaft is being made a skip shaft and is to be sunk at least 100 feet deeper, and to hasten developments a 15 H. P. gasoline hoisting engine is being put in at the shaft in the tunnel. A level will be run east at the bottom of the shaft. Arrangements are being made for a resumption of operations at the main shaft of the Russell M. Co. in Russell district. F. L. Paxton is in charge. J. T. Semmens of Gilpin, and M. Edwards of Nevada, have taken a lease on the Aetna-Kent property on Quartz hill and have commenced work. The Mont D'Oro M. & M. Co., operating in the Quartz

Valley district, owns the Smuggler, Felix and New Century claims, and has a lease and bond on the Delight and Colorado Girl lodes. The group is to be opened up through the tunnel on the Delight vein, which is in 300 feet. E. C. Sherman is manager. C. Philipps and M. Dalpez & Co., operating the Dump lode on Gregory hill, near Central City, are putting in new machinery and building a new shaft house. The main shaft is 330 feet deep and sinking is being continued. The 280-foot east and west levels are being driven and a good grade of ore is cut. Martin & Co. leasing on the Pederson lode on the Bobtail hill, property of H. Sayr of Denver, are working on the 200-foot west level. The ore is being hoisted through the Puzzle shaft, which is rented for that purpose from C. E. Wiley & Co. H. H. Hall & Co. are leasing on the Mountain City lode on German mountain, 60 feet from the surface. The Independent sampler at Black Hawk has been closed. Manager J. A. Gilmour of the Chase mine in Willis gulch, near Central City, reports the cutting of a large porphyry dike 600 feet east of the shaft at a depth of 300 feet, which has opened up into 4 feet of vein matter. C. Taylor of Denver and E. Baeder of Tolland have taken a lease and bond on the Norway mine on Mineral hill, near Central City, which is developed by a shaft down 50 feet and also a 150-foot tunnel. Some good surface ores were formerly taken out of this property, but it has been idle for some time past. The lessees report a very good showing of tungsten in the lower workings. Hatfield & Wornwood are sinking a new shaft on their Gold Coin property on Baltimore ridge.

An air compressor is to be put in by the Yankee Con. M. & T. Co., operating at Lombard, in the Yankee district. The new mill of this company is to be started up and an aerial tramway is to be built from the mines to the mill.

#### Lake County.

Work has been resumed on the Sunnyside tunnel on Mt. Elbert, near Twin Lakes, under the direction of G. Miller. B. Geiger has resumed work on his claims on Mt. Elbert.

Work is to be resumed on the Buckskin group, near Twin Lakes, by G. V. Booco.

Repairing the shaft and cleaning out the drifts at the Ballard-President property, Breece hill, Leadville, has been completed, and the lessees will soon be breaking ore. C. R. Osgood and B. Ross are the present lessees.

#### La Plata County.

On the east slope of the La Plata mountains, near the head of Junction creek, the Neglected mine, in the Oro Fino district, has been operated since 1902, and a mill is working low-grade ores which can not be profitably shipped. The mine is near the head of Gaines gulch, on the west slope of Monument hill. The ore deposits in the western part of the Durango quadrangle are in red sedimentary rocks, which have been intruded by dikes and sheets of grayish-green porphyry. The ore may be developed in the porphyry, at its contact, or in the sedimentary rocks near the porphyry. Often it appears to be a replacement of the porphyry, which is altered and decomposed near the fractured zone. Both porphyry and sediments are sometimes impregnated with pyrite for a short distance away from the broken zone, and through them extend little stringers of white quartz, which carry flakes and specks of telluride. In places where the sedimentary rocks are impregnated there does not appear to be any constant difference between the development of the ore in the sandstone or in the shale. In the Neglected mine the shale is considered the most productive horizon, while in the Durango Girl the richer ores so far have occurred in the quartzite below the shale. The Neglected mine is worked through a vertical shaft from which levels running east and west have been opened at depths of 85, 125 and 175 feet. The principal ores are telluride. Native gold, pyrite, and amalgam are present. The ores of the Durango Girl mine, in Walls gulch, on the east slope of Lewis mountain, are chiefly tellurides. The Ruby claim, south of Cumberland Peak, is interesting on account of the occurrence of native mercury in the ore. In Leavenworth gulch the Porcupine Co. is developing twelve claims.

#### Gunnison County.

Mine operators of the Tin Cup district are contemplating trying traction engines as a means of ore transportation from the mines to the railroads. The Woods Investment Co. of Cripple Creek, operating the Pie Plant group in Taylor Park, are 35 miles from St. Elmo, the nearest railway point. A 100-ton cyanide plant is treating the low-grade ores. The Taylor Park M. Co. is operating 6 miles north of the Woods property. It has one tunnel over a mile in length. Its ores are shipped to Aspen, but the company intends building a big concentrator at the mine. On Italian mountain, at the head of Taylor Park, bodies of lead ore have been opened up but cannot be shipped, as there is no way to get it out except by pack trains. The Brunswick M. & M. Co., owning the Jimmy Mack at Tin Cup, has a chlorination mill that cost \$115,000, but it is said it does not treat the ore successfully, therefore it is to be taken out and a concentrating plant substituted. Water came into the Jimmie Mack and gave trouble, so the management decided to drive a crosscut tunnel into East Gold hill, from above the mill. It is now 1500 feet in length, but will have to drive some 300 feet farther. The mill will not be remodeled until the Mack vein is entered by the tunnel. The Akron M. Co. have driven the Akron tunnel at White Pine 4000 feet and have cut the May Mazeppa vein at 3700 feet and a blind lead at 3600 feet.

#### Ouray County.

Arrangements have been completed for the resumption of work on the High Bridge properties on Sneffels creek, near Ouray. The property, consisting of three patented claims, owned by J. Canavan, has been idle on account of litigation which has been settled. The High Bridge shaft will be retimbered and a shaft house and hoist put in. This shaft, to a depth of 165 feet, was sunk seventeen years ago, when water caused a tunnel to be started lower down the mountain to cut the lead at a depth of 500 feet. This had been driven 600 feet when it was found that the shaft was being gradually drained. With the departure of snow, work is to be resumed on



the James Haskens property, the Black Cave group, 3 1/2 miles south of Ouray, on the Red Mountain toll road.

#### Sao Juan County.

The Brooklyn mine in the Red Mountain district is to be worked this summer. Water power is to be substituted for steam at the Pride of the West mine, near Silverton. Diamond drilling is being continued. E. Condon has been appointed foreman. It is expected that the 50-ton stamp mill of the Hamlet mine, near Silverton, will be started June 15. This is probably the first mill ever built in the San Juan in the winter. The tramway is half completed. The crosscut of the Charter Oak on King Solomon mountain, near Howardsville, is in 450 feet, with an estimated 100 feet to drive to tap the lead.

Sinking on the main shaft at the Esmeralda, near Silverton, has been temporarily suspended and work is being rushed on the second and third levels. Drifting on the vein both ways from the shaft will be continued for some time. It is reported that a mill and cyanide plant are to be built this summer. The payroll averages twenty-five men. Manager Thompson of the Delayed M. & M. Co. on Lime creek, near Silverton, intends to put in electric drills as soon as the Rockwood power plant is in position to furnish power, and also intends to build a mill. The Trilhy tunnel, near Silverton, is in over 1000 feet. The Auburn Con. G. M. Co. are in 275 feet with their tunnel in Dome mountain, near Silverton.

The Bailey M. Co. have a lease and option to purchase on the Bandora and Little Todd mines above Silverton, near the source of Mineral creek. Men will be put to work clearing the old workings.

#### San Miguel County.

The new 60-stamp mill of the Smuggler-Union Co. is running full time and twenty stamps of the old mill are crushing rock. The Tomboy mine and mill are running full capacity. The Stillwell tunnel has cut the Liberty Bell vein at a depth of 1800 feet, 1000 feet from the old shaft. The Liberty Bell mill has been started by Superintendent Chase, after having been closed down four months, giving employment to between 200 and 300 men. The close-down was for the purpose of installing a completely new plant.

#### Summit County.

The Mary Verna and North American companies, operating in the Ten-Mile district, above Frisco, expect to have machine drills in operation on their properties soon. Work at the Abundance mine, on Mineral hill, near Breckenridge, continues with three eight-hour shifts. On account of the melting snow surface water is bothering. The shaft is down 150 feet and work on a station has commenced preparatory to cross-cutting. Sinking will not be resumed until the surface water ceases to run into the shaft. The American Gold Dredging Co., on the Swan, near Breckenridge, have started prospecting drills under direction of W. Lytle.

Work has been started on the Buffalo placer mine, below Dillon. L. Kingsbury is manager. He has also started the Summit Banner placer mine.

#### Teller County.

The drainage tunnel committee of Cripple Creek mine owners has under consideration the construction of a \$750,000 tunnel to drain the properties in the district. The proposed tunnel would be 5 miles long, 8x12 feet, and would require five years for its completion. Although the matter is still only a subject of discussion, it is thought that favorable action will be taken by the prominent mine owners of the district. The project is said to be the result of the refusal of the Portland Co. to join the other mine owners in the construction of the second tunnel planned, as that tunnel would not benefit the Portland property. It is understood that the Portland people are satisfied with the new project and will subscribe liberally. The proposed tunnel would start 1 1/2 mile below the present tunnel and run beneath the water courses of Beacon hill and the El Paso and end under the Black Belle claims, east of the Vindicator property. On Signal hill, west of Cripple Creek, the Compromise M. & M. Co. is to sink a winze on vein matter cut at the 190-foot level of the shaft. I. Barber is superintendent. A rich strike is reported in the 350-foot level of the International, on Gold hill, Cripple Creek, by Lessee Webster. The Morning Glory No. 4 of the Work Co. of Cripple Creek is being operated under lease by three sets of lessees. At the north end of the claim Lessee Wrockloff is working. On the middle block Lessee J. W. Price is making regular shipments of smelting ore. On the south end Lessee Clark and associates are developing the ground. Lessee Carter, operating the Free Coinage property, Cripple Creek, is sinking a three-compartment shaft on the Pueblo claim and will drive laterals from the 200-foot level. Ore is being raised through the Ruby shaft, Cripple Creek, from a depth of 1200 and 1350 feet, bodies at the latter depth being reached through a winze. Work is being done by the Merger Co. under the direction of Superintendent Stark. Elsherry, Cain and associates, operating on the west block of the Teutonic claim, on Ironclad hill, have put up a gallows-frame 254 feet high and are putting in a 60 H. P. boiler. The hoist will be 8x10. The shaft has been sunk to a depth of 110 feet. The Prince Albert shaft, on Beacon hill, is down 300 feet and is being pushed with twenty men and machine drills. Mayfield and associates, operating the Mary Cashen, in Victor, are drifting in the 350-foot level and taking out good ore. The Milwaukee Mutual Co., operating under lease the Mahel M. shaft of the Gold Dollar Co. on Beacon hill, Cripple Creek, will put in a larger hoist and a cage. A rich shoot has been struck on the 650-foot level. J. K. Walsh intends to continue the Forest Queen shaft, Cripple Creek, to a depth of 700 feet, where a lateral will be started. O. D. Fogelman will sink another 100 feet on the Midway claim, between Bull and Ironclad hills, Cripple Creek.

#### IDAHO.

##### Boise County.

Sluicing the gravel in the 2 miles of river bed reclaimed by the Golden Treasure M. Co. by the completion of the Ox Bow tunnel, 30 miles from Placerville, has begun. L. A. Coate is manager. The entire body of the Payette river is turned by the dam through the tunnel cut in the granite. The bore in the rock is 10x12 feet. This is running two-thirds full. Turbine wheels, dynamos, etc., for a 10,000 H. P. plant are to be put in at the mouth of the tunnel.

#### Idaho County.

Z. A. Harris of Cleveland, O., president of the Twentieth Century G. M. Co., is taking supplies and machinery in to the company's property in the Thunder Mountain district, near Roosevelt. The company intends to put in a 30-stamp mill. The company has an electric light plant for lighting the mine and mill. The mill will be put up south of the three tunnels. J. R. Noss is superintendent.

It is reported that the Thunder Mountain & Big Creek Con. M. & T. Co. has secured control of the Werdenhoff M. & M. Co., Crown M. Co., Empress M. & M. Co. East Dewey G. M. Co., Blackfoot G. M. & Dev. Co., Ltd., Dewey Ledge G. M. Co., Rainbow Mountain G. M. Co., Thunder Mountain G. M. Co., Campfire G. M. Co., Blackfoot Extension G. M. Co., and the Buffalo group of claims, between the Sunnyside and the Dewey mines. It is announced that sufficient shares of the various companies have already been secured to insure the deal going through. The officers of the combination are: J. E. Morhardt, New York, president; F. W. Hunt, Boise, Id., vice-president; James B. Pratt, New York, secretary, and E. H. High, Weiser, Idaho, treasurer. The company intends to put in a power plant and build a railroad into the Thunder Mountain district and also to build a 50-stamp mill. W. L. Lowry of Denver, Colo., has controlling interest in the Evergreen mine, on the Clearwater river, 6 miles east of Grangeville, and will put a 100-ton plant on the property.

H. H. Schieler, manager of the Idaho Con. Little Giant M. Co. of Warren, will put in an electrical transmission line to furnish power for the mine and mill. The contract calls for a 150 K. W. generator, one 75 H. P. motor and two 20 H. P. motors, transformers, etc. The larger motor is to be attached to a 75 H. P. Rand air compressor, which will furnish power for hoisting, pumping and drilling. A 5-stamp mill will be put in under the mine dumps to work the ore which has been thrown over as too low grade to hear reduction. Sampling shows that these dumps carry values above \$5 per ton. Water from Warren creek will furnish the power for the generator.

#### Lemhi County.

Work is to be resumed in the Upper Lemhi district by the Excelsior Co. of Spring mountain. In the north end of the district the Union-Lemhi Co. are doing considerable work. A. R. Nichols of Union, Fremont county, is president and W. E. Thompson of Kootenai secretary-treasurer.

#### Shoshone County.

The Roberta M. & M. Co., developing claims on Canyon creek, near Gem, is running a crosscut tunnel. A. Penaluna of Butte, Mont., is president. The shaft of the Oom Paul on Canyon creek is to be continued from the 220-foot level. An electric hoist is being put in.

#### MONTANA.

##### Fergus County.

A 100-ton mill and cyanide plant is being put up on the Maginnis mine, near Malden. It is announced that P. W. McAdow of Punta Gorda, Fla., will return to Malden to take over the operations about to begin on the Alpine claim.

The Queen G. M. Co. are boring with two diamond drills on the Bullard property at Kendall.

##### Granite County.

G. H. Savage, manager of the Milwaukee G. Ex. Co., is putting up a tramway at Red Lion, near Philipshurg, to carry ore from the Hannah mines to the new 100-ton mill.

##### Jefferson County.

The Bullion mine of the Cataract M. Co., near Basin, is shipping to the Helena smelter. The Minnesota mine, near Corbin, is being developed by M. Manuel. It is stated that development work is to be started on the Rose Gold properties in Golconda gulch, near Jefferson.

##### Lewis and Clarke County.

The shaft at the Red Bird mine, near Austin, is being sunk another 100 feet, giving a depth of 450 feet. It is shipping to the Helena smelter. It is reported that Rose & McNamara of Helena are to increase the mill and cyanide plant of the Ruby Gulch mine. The East Helena smelter of the American S. & R. Co. is running three furnaces. New roasters, with a capacity of 120 tons daily, are to be put in.

##### Silver Bow County.

Judge Hunt has denied an injunction sought by F. A. Heinze against the Parrot M. Co. in Butte to prevent its mining in a vein which he contends apexed in the Nipper mine, on the ground that a sufficient showing had not been made. In regard to the so-called "blue" vein, Judge Hunt holds that the question hinges on where the discovery is in the Nipper, and in the absence of sufficient showing he grants the injunction in that particular. The decision is considered an important victory for the Amalgamated Co. The Parrot mine has been closed since the proceedings started and will now reopen. It is reported that the Leadville M. & S. Co. has started work 18 miles north of Butte.

#### NEVADA.

##### Lincoln County.

Superintendent F. P. Swindler, of the Bamberger-DeLamar G. M. Co. at DeLamar, has been making arrangements for a slimes plant below the mill with a capacity of 750 tons daily.

The Nevada-Eldorado M. Co. has been organized to work the Silver Legion mines at Eldorado canyon. E. J. Roberts is manager. The new 60 H. P. gasoline hoist at the Quartette mine, Searchlight, has been started.

##### Lyon County.

The Bluestone copper mine, 3 miles from Yerington, has been sold to M. J. Heller and others by H. E. Miller, A. Miller and J. W. Scott. A new concentrating plant has been put in.

#### Nye County.

Plans have been completed for the smelter at Soda-ville and it is announced that construction is to be started soon.

#### Storey County.

The Sierra Nevada M. Co., through Superintendent A. J. McDonnell, is leasing to tributaries that part of its territory on Cedar hill above the Riley tunnel, near Virginia City, on what was known as the Sacramento, Meridith, Allen and other claims before they were purchased by the Sierra Nevada Company. The leases are granted for one year and pay on ore extracted, as follows: On the gross value of all ores yielding \$10 or under per ton, 10%; from \$10 to \$15 ore, 12 1/2%; \$15 to \$25 ore, 15%; from \$25 to \$50 ore, 20%, and all ores yielding \$50 or over per ton, 25%, and 10% of the assay value of all tailings from ore extracted and milled.

#### White Pine County.

Work has been started at the North Mountain mine of the Consolidated Mercur Co. at Cherry Creek, under the direction of W. S. Brown.

E. Wallace of Denver, Colo., has bought the Joanna mine, near Cherry Creek, for \$50,000. A gasoline hoist has been put in at the Brooks mine at Pilot Knob.

#### NEW MEXICO.

##### Grant County.

The National G. & S. M. Co. at Stein's Pass reports a rich strike on the Beck mine. A. C. Young has sold the Silver Bell mine, near Hachita, to F. C. Emory, secretary of the Golden Cove M. Co. of Sonora, Mex. The King M. Co. has resumed operations at Old Hachita, with H. Marmion of San Antonio, Tex., as superintendent. Detroit-New Mexico M. & Dev. Co. has commenced placer operations on Whitewater creek, 3 miles southwest of Central. The Pyramid Peak M. Co. has been organized to take over the Nelly Bly and Lee mines, near Lordsburg, and work has been resumed on the Cobra Negra and the North American mines. The shaft on the Bly has been entirely retimbered, the mine has been unwatered and sinking has commenced, the work being done by three eight-hour shifts.

##### Otero County.

The Tularosa M. & M. Co. is building a concentrator 11 miles from Tularosa on the road toward Mescalero. Development work is being done in the company's mines.

#### OREGON.

##### Baker County.

Manager F. D. Smith has driven the Zelda tunnel 100 feet from the shaft and is taking out ore being crushed in the 10-stamp mill on Snow creek, near Tipton. It is reported that Manager Kelly will order a hoist and commence sinking at the I X L near Greenhorn. The workings are down 300 feet.

T. S. Van Fleet, manager of the Gold Bug group, Red Boy district, near Granite, has returned from the East and is pushing operations at the Gold Bug. H. Blake has accepted the superintendency. The old Geiser-Hendricks Co. has been reorganized and the working capital increased from \$25,000 to \$250,000. This company owns the Taber Fraction, Midway, Platts of Cracker Creek and the Gem in the Sparta district. The Taber Fraction and the Gem are on the producing list.

##### Douglas County.

The Crystal Consolidated Co. at Bohemia is putting its mill into condition for active operations. Work is progressing on the Oregon-Colorado at Bohemia.

The Continental G. M. Co., with headquarters at Portland, and operating the Continental mine at Nugget, 12 miles from Myrtle creek, will let the contract for a mill with a capacity of fifty tons daily on June 1. W. B. Stewart is manager.

##### Jackson County.

The Sterling placer mine, 9 miles south of Jacksonville, has been sold by H. E. Ankeny of Eugene and V. Cook of Portland to a company in which F. F. Blakeley of Portland is interested. J. D. Heard will have charge of work.

##### Josephine County.

The drift on the main vein of the Martha, near Wolf Creek, has been driven 900 feet under the direction of Manager Bishop of the Greenback Co. A. Howland, superintendent of the Mt. Pitt mine, near Grants Pass, where a double-tub arrastra is operating, states that the management intends putting up a stamp mill this year. A. C. Hooper is manager.

##### Union County.

James Warde and C. C. Nepple of Baker City have bought quartz claims in the Camp Carson district, 38 miles from Hilgard, from W. M. Heughan and P. Mays, and have started development work.

#### SOUTH DAKOTA.

##### Pennington County.

The Bullion G. M. & M. Co. is preparing to build a 150-ton cyanide plant at Keystone. They will crush, amalgamate and concentrate the ores and recrush the concentrates for cyaniding. A compressor and electric power plant is to be put in. F. H. Long is manager. The Minnesota M. Co., 4 miles from Rochford, is drifting on two levels and has put in a new pump. They intend to put in a new hoist. The Golden West M. Co. has started its mill at Rochford.

##### Lawrence County.

The Clover Leaf M. Co. is developing the Uncle Sam mine, near Perry, and are crushing ore from the 600-foot level with 20 stamps. The Gladiator G. M. Co. intends to start work in Deadwood gulch, near Deadwood.

#### TEXAS.

##### Marion and Bowie Counties.

The iron ores of northeastern Texas are described in a recent bulletin of the United States Geological Survey. The area studied embraces a group of counties in the northeast corner of the brown hematite district. There is a commercial basis for the subdivision of the ore field, for the deposits in these counties are so located that any iron industries based on them must be considered as tributary to two possible distributing points—Texarkana, Bowie county, and Jefferson, Marion county.



Within the area under consideration there are five geologic formations, representing the Tertiary and Pleistocene periods. Of these only the Claiborne sands and greensands and the Sabine clays and sands are of importance in connection with the ore deposits. The ores are present in quantity and cover a large area, but they do not occur in very thick beds at any point. The deposits tributary to Queen City are 4 to 6 miles north and northwest of that town. The streams have cut through the iron-bearing beds in this district, so that the workable deposits are to be looked for only on the hillsides and hilltops. In the ravines and on the slopes, however, much loose ore has been carried down and spread as a thin coating over the surface. The thickest single ore bed opened in this section is 30 inches thick. Numerous deposits of lignite occur in this area. Along the Missouri, Kansas & Texas Railroad, from Jefferson to Dargersfield, important ore deposits occur. The principal deposits are between Lancaster and Veals Switch, northwest of Hughes Springs. The richest ores are likely to be found near the surface. The operation involved in mining is shallow stripping. The scarcity of water necessitates the working and shipping of lump ore only and forbids hydraulic mining. The location and form of the ore bodies, as well as the character of the ore, will prevent the use of steam shovels.

#### Travis County.

A new deposit of celestite, or strontium sulphate, was developed during 1904 west of Austin, in the Mount Bonnell and Mount Barker district, in the Glen Rose formation, which consists largely of even-bedded strata of different thicknesses of argillaceous, arenaceous, chalky limestones, alternating with thin strata of marly, arenaceous clay. These rocks contain undeveloped beds of Epsom salts, strontianite and other materials. The magnesium limestones are soft and of a yellow color, and alternate with softer marls of similar composition, sometimes accompanied by pockets of crystalline nodules composed of calcite, aragonite, strontianite and celestite. The celestite is found in cleavable masses of irregular shape, ranging in weight from half a pound to 100 pounds, its color varying from white to pale bluish gray. R. C. Walker of Austin, who has been developing the deposit, finds that the deeper he extends his workings into the hill the purer and more abundant is the celestite. Samples of this celestite show on analysis from 97.64% to 98% strontium sulphate. During 1904 one carload of seventeen tons of this mineral was mined and shipped to Germany. The value of celestite varies from \$20 to \$50 per ton. This was the only place in the United States where strontium was mined during 1904. No strontium salts were imported into the United States during 1904.

### UTAH.

#### Beaver County.

The shaft of the Frisco mine at Frisco is being sunk from the 200 to the 400-foot level.—Water is being hoisted from the Sulu and the Crystal Contact is being worked by D. P. Rohlfing of Frisco.

The O. K. mine, in Beaver Lake district, is being worked under lease by Jas. McKeon.—The tunnel being run to cut the ore body of the Wasatch King in Beaver Lake district is to 340 feet. J. C. Brownfield is superintendent.—D. Ferguson has charge of work at the Moscow mine, in the Star district.

#### Salt Lake County.

The Bingham-New Haven, at Bingham, is sinking a winze on the Stoddard vein 250 feet from the mouth of the tunnel.—At the Bingham Central the Whitley tunnel, now in 200 feet, is being driven for the Red Elephant vein, which is still 900 feet ahead.—The Jeff Davis tunnel is in 530 feet.

#### Sammit County.

The Ontario mill at Park City has been started on low-grade ore.

#### Tooele County.

The management of the Galena King mine will extend the Honerine tunnel from the Honerine 1000 feet to the Galena King in order to give a cheaper method in handling the ore. The proposed tunnel should cut the Ada, St. Patrick and Hercules lode. It is reported that copper ore is being opened up in the 1100-foot level of the main Honerine ledge. W. F. Snyder is manager and E. J. Raddatz superintendent.

#### Utah County.

L. Western and Webb Bros. are preparing to resume operations at the Golden Gem, in American Fork canyon.—G. Tyng, manager of the Wyoming mine in American Fork canyon, says he will not be able to commence regular shipments of ore until the middle of July due to deep snow.—The lime rock quarries and kilns east of American Fork have resumed operations after a short shut down.

### WASHINGTON.

#### Cowlitz County.

The coal on Coal creek, 12 miles west of Kelso, is being developed. The bed is from 6 to 7 feet thick, with two small partings of sand. The top bench has 12 to 18 inches of bony coal, the middle bench 2½ feet of better quality, and the lower bench 18 inches of coal, in part good. The coal bed is overlain by soft sandstone. In the mine the coal looks bright, but on exposure it loses its luster, cracks somewhat and partially slacks. Some part of it is well banded and contains small pieces of fossil resin. Analysis shows that this coal contains a high percentage of water, ash and sulphur. The coal was used in running the engine of the mine, however, and appeared to burn well.

#### Ferry County.

An incline shaft is to be sunk on the Morning Glory mine, near Republic, to develop the ore shoot carrying high silver values recently uncovered.—In the Belcher district, near Republic, the Belcher and Copper Key are being worked.

#### Okaogao County.

The Mineral Hill T. & M. Co., S. L. Boyer of Danville superintendent, is working the Triune mine at Golden camp, 7 miles from Oroville. The crosscut tunnel is in 300 feet and will be driven 400 feet farther. It has cut two quartz veins, one at 225 feet in and the other at the end of the tunnel. The 10-stamp mill has been started.

#### Stevens County.

A discovery of tungsten is reported in the Cedar Canyon district by the Roselle M. Co. W. S. Thyng, J. B. Mosley and A. Schulze, all of Spokane, are interested.

### WISCONSIN.

The zinc and lead deposits of southwestern Wisconsin are described by U. S. Grant in Bulletin 1260 of the United States Geological Survey. This region comprises Grant, Lafayette, and Iowa counties. It lies between the Wisconsin river on the north, the Illinois boundary on the south, and the Mississippi river on the west. The principal towns are Mineral Point, Platteville, Dodgeville, Darlington and Shullsburg, which are connected by railway with zinc smelters at LaSalle, Peru, and Wenoona, Ill. Some of the zinc is also smelted at North Chicago, and most of the zinc carbonates and the lower grades of the zinc sulphides are shipped to Mineral Point, Wis., where an extensive plant for the manufacture of zinc oxide and sulphuric acid is located. The important deposits of zinc and lead occur in the Galena and Platteville limestones, which comprise the surface rocks over the larger part of the region. The Platteville limestone is made up largely of nonmagnesian beds, although in its lower part there are certain magnesian strata. The thickness of the Platteville averages 55 feet. The Galena limestone is essentially a dolomite, most of which is coarse-grained and porous and occurs in beds ranging from 1 foot to 4 feet in thickness. The ore consists of galena, sphalerite, smithsonite, and iron sulphide, the last usually in the form of marcasite. The ore deposits occur in cracks or irregular openings, in apparently brecciated or very porous parts of the Galena limestone, and in small particles in certain layers of rock. These three types are frequently well-defined, though at some places they grade into one another and can not be regarded as genetically distinct. In former years, and today in some of the smaller diggings, mining was carried on in a very primitive manner for the most part. The ores were usually mined, brought to the surface by hand and were cleaned by cobbing or by hand jigging. The present development of the region is due in great part to the introduction of improved methods of mining and of concentrating the ores. During the last three years 30 concentrating mills have been put up. There is good reason to believe that the bodies of sphalerite below the level of ground water will last for many years and that a considerable mining industry will be carried on here. The present high prices of lead and spelter, coupled with the fact that the lower grades of sulphide ores can be brought up to higher grades by roasting and magnetic separation, make the outlook promising. In selecting an area for prospecting care should be taken to choose one that has, below the level of ground water, a reasonable thickness of ore-bearing rock—that is, of Galena limestone, or, in the eastern part of the region, of the upper member of the Platteville limestone. Expensive explorations below the Platteville limestone are not recommended. It is suggested that preliminary explorations be made by drilling rather than by sinking expensive deep tests pits and shafts.

### FOREIGN.

#### AUSTRALIA.

##### New South Wales

The Delprat process for treating the zinciferous ores of the Broken Hill Proprietary mines, after passing through the usual experimental stage, now seems to be realizing all that was hoped for it by the inventor, D. G. Delprat, the manager of the property. Salt cake is crude sodium sulphate. It is made by treating common salt with sulphuric acid. If less sulphuric acid is added than is required to decompose the whole of the salt, then sodium chloride and sulphate of sodium will be the main products; but if excess of sulphuric acid is used, then bisulphate of sodium or acid sulphate of sodium and the normal sulphate will be the main products. In practice the salt cake obtained contains from 95% to 96% of sodium sulphate, and the remaining 4% to 5% is mainly sodium hydrogen sulphate; traces of undecomposed salt and other materials remain. In some specifications Mr. Delprat adds sulphuric acid to this solution; in others he claims sodium bisulphate as the active ingredient. The crude sodium sulphate is added to the solution until the specific gravity is stated to be approximately 1.4; in other words, the solution must be practically saturated. Mr. Delprat's solution, therefore, is made up with two objects in view, the first being to raise the particles of sulphides by the attachment of gaseous bubbles, and the second to densify the solution so as to enable each bubble to support a greater load. One strange feature about the "salt cake" process as carried on at the Proprietary mine is that a large sulphuric acid plant has been erected to supply the necessary acid for working it. The sulphur dioxide is produced by the Carmichael-Bradford process, and from this sulphuric acid is made in the ordinary way. Gypsum and sulphides of lead and zinc, with a small amount of siliceous material, is made into small balls, placed in a converter and heated; afterwards a current of air is blown through, when sulphur dioxide is given off, and the action continues as long as excess of sulphur is present. The gypsum required for the process is obtained within 5 miles from the Hill. It consists of hydrated sulphate of lime. On being heated to a temperature from 120° to 130° C. it is converted into plaster of Paris. On raising the temperature to 200° C., the anhydrous sulphate is formed. This product, from which nearly 21% of water is driven, when moistened with water sets slowly and returns to the original state. After dehydrating, the powdered sulphate of lime is mixed in the following proportions with slimes and concentrates: Slimes, 3 parts by weight, concentrates 1 and gypsum 1, or 60% slimes, 20% concentrates and 20% gypsum, the last becoming 16 or 17 parts when heated, owing to loss of water. The sulphur contents of the mixture vary from 13% to 15%. The whole of these materials are mixed and moistened with water, then passed through a pug mill. The small amount of water used serves to partly set the product, owing to the sulphate of lime becoming partly hydrated. This also serves to bind the

mixture together. The whole lot is spread out on a drying floor and broken into pieces not exceeding 2 inches in diameter. It is allowed to stop there until all surface moisture has been evaporated by the joint action of wind and sun. When dry it is shoveled into the converter. A cover is luted on to the converter. This cover is connected onto a horizontal flue by means of a telescopic pipe. Three converters in line are attached to the same flue. A couple of nitre pots are placed farther along the flue; these connect with the leaden chamber, having a capacity of 40,000 cubic feet. The success of the "salt cake" process and also the manufacture of sulphuric acid has opened up great possibilities for the Broken Hill mines. Mr. Delprat recently stated that the mines of Broken Hill turned out ore annually which contained 200,000 tons of zinc, or more than one-third of the total zinc annually produced.

#### Victoria.

The progress of the gold dredging industry in the State continues to be widely discussed, and it is probable that a further extensive development may take place during the present year. At the new Chum Railway mine there has been another discovery in the new formation in the center of the country winze, 306 feet below the 3586-foot crosscut. The stone is well mineralized, and shows nice specks of gold. The manager is of opinion that the company has intersected the top of a new formation, and that the stone so far uncovered is of a payable character. If the supposition that they have cut the top of the reef be correct, as "legs" invariably carry the best gold, the development would prove one of the most important events in the history of the gold fields. The discovery of a payable formation at such a great depth as 1172 feet from the surface has naturally had the effect of reviving the interest of capitalists in many neglected properties in which similar results are regarded as being more than probable. Victorians are impressed with the possibilities of the Bendigo district, notwithstanding the extent to which it has been worked during the last fifty years. The State mining department has mapped out the northern extension of the lines of reef, and guide posts will be erected for the information of companies and investors. The idea is to provide that companies shall have no difficulty in locating the most suitable sites for their shafts. They will now be able to tell to a very few feet the point at which they should start sinking. In the course of time a survey of the southern extension of the lines of reef will be proceeded with, and the same facilities will be afforded to prospectors and investors at the end of the field.

E. J. Dunn, director of mining, who has originated and supervised the system, thinks there is unlimited scope for the investor in Bendigo. The people, he says, do not even now grasp the possibilities which he set forth in the report on the field which he prepared for the mines department some years ago. Nowadays, with the knowledge which has been obtained by years of work, prospecting is comparatively easy, and no money should be thrown away. As for the deep ground, the fact that at the New Chum Railway mine gold-bearing stone has been discovered at a depth of 1162 feet is very encouraging. All indications are favorable to important developments at great depths. The Victorian State Premier has announced his intention of abolishing all mining royalties. A rich patch of gold-bearing country has been opened up near Mount Tara, 9 tons of stone yielding 82 ounces 11 pennyweights of smelted gold, exclusive of that obtained from the slimes.

### CANADA.

#### BRITISH COLUMBIA.

##### Boundary District.

G. H. Collins, superintendent of the Montreal & Boston Con. properties at Phoenix camp, has closed the several mines pending an examination. The mines affected are the Brooklyn, Rawhide and Stenwinder. The pumps have not been pulled and the mine will be kept free of water until examined by experts. The number of men affected is between 200 and 250 at the mine and smelters. There are reports of a sale of the property.

—Boundary shipments for the week ending May 20 were as follows: Granby mines to Granby smelter, 13,005 tons; Mother Lode to British Columbia Copper Co.'s smelter, 3456 tons; Brooklyn to Montreal & Boston smelter, 2161 tons; Rawhide to Montreal & Boston smelter, 732 tons; Mountain Rose to British Columbia Copper Co.'s smelter, 99 tons; Dominion Copper Co. dump to Trail smelter, 60 tons; Emma to British Columbia Copper Co.'s and Nelson smelters, 132 tons; Oro Denoro to Granby smelter, 99 tons; Last Chance to Montreal & Boston smelter, 61 tons; total shipments for the week, 19,755 tons; total for the year, 364,038 tons. District smelters treated the following tonnage for the week: Granby smelter, 13,350 tons; British Columbia Copper Co.'s smelter, 4228 tons; Montreal & Boston smelter, 2954 tons; total treatment for the week, 20,536 tons; total for the year, 370,509 tons.

M. Folkanham, manager in charge of the work at the Seattle mine at Brown's camp, reports that the ore in the tunnel is improving. The steam drill is making good progress.

##### Nelson District.

As a result of the outcome of the trial of J. R. Roherts, the Silver King, Poorman and Granite mines, near Nelson, and other Silverton properties operated by M. S. Davys have been closed down. If they are started up again, it will be with non-union labor.

##### Rossland District.

The tonnage of ore shipped from and crushed at the Rossland mines for the week ending May 20, and for the year, was as follows:

	Week.	Year.
Le Roi.....	2,175	51,480
Center Star.....	1,740	35,000
War Eagle.....	1,350	25,530
Le Roi No. 2.....	90	2,893
Le Roi No. 2 (milled).....	.....	2,800
White Bear.....	.....	1,100
White Bear (milled).....	350	3,980
Junco.....	240	2,623
Spitzee.....	90	3,681
Velvet-Portland.....	.....	1,977
Totals.....	5,975	134,059

A winze is being sunk from the 100 to the 200-foot



level of the Spitzee at Rosslund.—It is reported that the White Bear will be closed for three months until adequate electric power can be put in.—Stevenson, Howard & Johnson have leased the R. E. Leo group at Rosslund from the R. E. Lee Gold Mines for a year, and have begun work on the properties. They are prospecting the ledge on the surface to determine the best method of operating.

#### Vancouver Island.

(Special Correspondence).—The Tyee Copper Co.'s smelter returns for April were as follows: Smelter ran sixteen days and smelted 3324 tons of Tyee ore, giving a return, after deducting freight and smelting charges, of \$47.106.

Duncans Station, May 19.

### MEXICO.

#### Sonora.

At Mina del Oro, in the Ures district, 16 miles east of Poza, the Porvenir de Sonora M. Co., J. Henderson, manager, have completed a new reduction plant and hoist.—The Sombretillo M. Co., C. F. Folman, manager, is putting in a 30-ton cyanide plant south of Sasabe in the Altar district.

#### Zacatecas.

The 50-stamp mill of the Mozquital gold mines at Mezquital del Oro have been remodeled and completed and a new steam hoist is being put in. M. Cockerell is manager. The total working costs for mining, milling and cyaniding do not exceed \$3.75 gold per ton. Four levels below the main adit tunnel are being unwatered, each 80 feet in depth, and the first and second of which are 1500 and 820 feet respectively in length.

### PHILIPPINE ISLANDS.

The fifth annual report of the Philippine Mining Bureau states that gold has been found in almost every island of importance of the group. It has been worked by natives in placers and in stringers. R. von Drasche, a German geologist who has done some field work in the islands and has published papers upon Philippine geology, states that at the time of his visit to Mambulao and Paracale (Camarines province) there were over 700 natives working the placer deposits for gold. It was estimated by a Spanish governor of Manila of the seventeenth century that the annual output of gold from Camarines Norte was \$200,000. The natives in no part of the islands have been able to dredge or sluice, nor have they penetrated more than 50 or 100 feet into the rock at any place. In the northern part of Masbate, near Aroroy, three American mining companies have staked out and recorded a large number of placer and lode claims, and work is going on upon these at the present time. A number of placer claims have been staked and recorded by Americans in the headwaters of the San Mateo river in Rizal. In the Pigtao region of northern Mindanao it is estimated the value of the gravels to be from 15 to 25 cents to the cubic yard. Gold has been worked by the natives in Fidelisan, Bontoc province; Suyoc, Dugon and Tuboc, Lepanto province; Acupan, Tabilio, Capunga and Itogas, Benguet province; Capan and Penaranda, Nueva Ecija province; the Islands of Polillo and Cataduanes, Labo, Capalongan and Maculabo, in the Camarines; Atimonan, in Tayabas; and in Cebu, Panay, Samar and Panay. The gold from Benguet, Lepanto, Surigao and Misamis has been found in small seams or stringers in quartz, although true veins have been found in all of these districts save the last. The most promising veins from Mambulao and Paracale are reported to be contact veins between gneiss and diorite. The best-defined veins appear to be entirely in the older crystalline rocks; those of the Camarines and Masbate notably so. There are deposits of low-grade, free-milling, and partially or wholly refractory ores in Lepanto and Benguet. Copper has been reported from the Islands of Luzon, Mindoro, Masbate, Panay and Mindanao, but the only important deposits so far known are those of the district of Mancayan, Lepanto province, in northern Luzon. The report of copper in the Island of Balahac, the Paragua group, could not be verified by the mining engineer of this bureau in a recent visit by him to that island. Samples of native copper, said to have been brought from Masbate, have been shown to the present Chief of the Bureau, but no information of value was obtained from the prospector exhibiting them. The copper deposits so far known in Mindoro are all of copper pyrites, apparently of limited extent; and of the ores reported from Mindanao nothing is known. There are veins of chalcocite in the Camarines and in Bontoc, but they have not yet been prospected or developed and data concerning them are not available at the present time. The important deposits at Lepanto are at Suyoc and Mancayan, in the southern part of the province. These veins carry the sulphides, arsenides and antimonides of copper, among them enargite, and its variety first identified here, luzonite. From samples obtained in the breasts of old workings at Mancayan it has been estimated that the ores average 16% in copper, with a gangue of quartz. The working and smelting of the ores of Mancayan were carried on by the Igorrotes of Lepanto before the Spanish conquest. The metallurgical treatment was so ingenious, complicated and effective that it unquestionably points back to an older contact with civilization, probably with the Chinese from the north. The mining, of course, has been most avaricious and the old workings will require thorough timbering before modern methods of exploitation can be employed. But little is known of lead deposits in the islands, and there is reason to believe that their distribution is not wide. Crocoite, the chromate of lead, occurs with gold ores in the Camarines, but it has not so far been found of economic importance. Galena, the sulphide and common ore of lead, has been found in Bontoc, the Camarines, Marinduque and Cebu. Silver ores have not yet been discovered in the Philippines. The silver occurring here is in argentiferous galena or alloyed with the gold. The Mining Bureau is now investigating an occurrence of platinum in the gold gravel deposits of Rizal. From present information platinum and associated rare metals do not seem to be of sufficient amount in these sands to be of economic importance; but the

identification of platinum in the Philippines, after many reports of its occurrence hitherto unconfirmed, may lead to renewed search in similar fields. Zinc has so far been found only as sphalerite in unimportant and unwelcome amount in a few of the gold veins of the northern Camarines. Tin has not yet been discovered in the Philippines. A large deposit of rich manganese ore has recently been found upon the Island of Masbate, but at the present time no details of its occurrence are at hand. Important deposits of magnetite and hematite are found in Abra province, in San Miguel and Angat, Bulacan, in Bosoboso, Rizal, and in the Camarines. The deposits of Bulacan are extensive and can be readily worked. Several of the ores are suitable for the manufacture of Bessemer steel, and one of the Angat ores is notable in that it contains cobalt in appreciable amount. The natives of San Miguel and Angat have worked these ores in small charcoal furnaces for over a century and have established a good reputation and trade for the plowshares they produce. Specimens of the sulphide of antimony, stibnite, were found in small quantities in a nipa house on the south slope of Mount Maquiling in Batangas. The most important of the mineral resources of the Philippines is probably the best grade of lignite coal. This is of Tertiary age and similar in all most important respects to that of Wyoming, Washington and Japan. The best coal is free from sulphur and relatively low in moisture and ash. It is known in the Island of Batan, Albay province; in Bulalacao and Samarara, southern Mindoro; in Danao and Compostela, Cebu; on the Gulf of Sibuguey, in southeastern Mindanao; at Calatrava, Negros; and at Bislig, in eastern Mindanao. Some of the coal of Abra, Rizal and eastern Negros is also believed to be suitable for use in steamships and in stationary furnaces now burning Japanese and Australian coal. A division must be made between the jet black, comparatively hard coals, probably of Eocene age, and the brown wood coals, much softer and more friable, of later age, and in large part not suitable for transportation. Both coals contain pyrites in some seams or portions of seams, but the black coal can, in most cases, be mined free from sulphur in this objectionable form. The brown coals are not of sufficient value, compared with older coals, to justify the expense of working at the present time. The best black coals are many of them strong enough for transportation, can be mined at reasonable cost, and presumably at a good profit, and should largely take the place of imported coals in the Philippines. Their fuel value is from two-thirds to three-fourths that of the best Welsh coal, very little short of that of the Australian, and equal to that of many of the Borneo and Japan coals, which they strongly resemble. The thickness of the seams of the black coal varies from a few inches to 18 feet. A very large number of the best seams are from 3 to 5 feet thick. They lie with variable dip from 0° to nearly 90°, and in some fields the beds are irregular, twisted and faulted. Careful and thorough prospecting with drill, such as is being carried on by Lieutenant Wigmore in Batan, should precede extensive development in most of the fields of the Philippines. Sufficient mining has already been done in the Danao and Compostela coal fields of Cebu to demonstrate the value of the deposits there. Petroleum has been found in Tayabas province, where it is understood some development is now going on, and at Toledo, Asturias, and Alegria, on the west coast of Cebu. A well was operated for a short time in Toledo, but since the war work has not been resumed. The sulphate of lime in the form of crystalline gypsum and gypsum earth is found in Rizal, Laguna and other provinces of the islands. Much of this might be calcined for the production of "land plaster" and plaster of Paris, but none of it seems to be so used. Large and important deposits of limestone are found throughout the islands. In many provinces the rock is quarried and calcined, producing excellent lime that brings a very good price. White clays, or kaolin, have been found in the Provinces of Abra, Camarines, Ilocos Norte, Antique, Benguet, Cagayan, Isabela, Laguna, Marinduque, Masbate, Pampanga, Pangasinan, Albay, Romblon and Zambales. The suitability of these for the manufacture of porcelain and china is now being investigated. Red clays, from which natives make large amounts of pottery for local use, are found in almost every province in the islands. The statistics and technology of this important industry are under investigation at the present time. Fire clay has been found in the coal beds, and may afford a profitable industry in the future. Red brick are made in large quantities in Bulacan, Capiz, Rizal, Ilocos Norte, Isabela, Marinduque, Masbate and Pampanga.

### Personal.

R. C. VIDLER has returned to Silver Plume, Colo., from London, England.

T. H. LEGGETT and W. A. Pritchard have been examining mines in Spain.

J. C. LEWIS of Portland, Or., has been appointed State engineer of Oregon.

W. P. O'MEARA of Salt Lake City, Utah, has been visiting San Francisco, Cal.

J. N. SCOTT has been appointed manager of the Dundee M. Co., near Nelson, B. C.

A. W. WARWICK has resigned the editorship of the Mining Reporter, Denver, Colo.

R. S. BRADLEY of Boone, Iowa, has been at the Triune mine, Okanogan county, Wash.

L. HUNDESEN, M. I. M. M., has returned to London from the Dutch East Indies.

ED. BEEDLE has been appointed foreman in the Oustomah mine near Nevada City, Cal.

F. M. MOTT of Oakland, Cal., is manager Los Cochis M. Co. at Los Cochis, Sonora, Mexico.

J. NELSON has been elected manager Nelson mines in Elkhorn district, near Park City, Utah.

J. H. LEISHMAN is manager Wide West M. Co., Cherry Creek, White Pine county, Nev.

E. BAMBERGER, manager Daly-West mine, Park City, Utah, has been visiting in Seattle, Wash.

L. EGGERS is superintending the building of a cyanide plant for the Los Reyes M. Co. Pecos, Mex.

J. V. BOHN has been appointed superintendent of the Mammoth M. & P. Co. at Mammoth, Mont.

F. S. WILHELM of Chicago, Ill., has been elected general manager Arispe M. Co., Cananea, Mexico.

W. E. THORNE, manager Snowstorm Hydraulic Co., Fairplay, Colo., has returned there from Denver.

F. J. HARD, manager Vesuvius mine at Bohemia, Or., has returned to the mine from a visit to the East.

D. A. LYON has been made assistant professor of geology and mining at Stanford University, California.

H. M. RAE has been elected president and general manager North Moccasin G. M. Co. at Kendall, Mont.

FRED G. FARISH has returned from Sinaloa, Mex. and is at present at the Creston-Colorada, Torres, Sonora, Mexico.

J. AUGUSTINE, superintendent Berlin mine near Baviacori, Sonora, Mexico, has returned to the mine from Minnesota.

CHAS. BROCKINGTON will be retained as superintendent and W. J. Connors as foreman Orleans mine, Grass Valley, Cal.

J. N. CONNER has been appointed superintendent of the smelter of the American-Mexican M. & D. Co., Velardena, Mex.

D. HARTLEY has been elected superintendent Union M. Co., working placer ground at Reservoir hill, near Placerville, Cal.

R. H. CHANNING, manager Utah Con. mine at Bingham, Utah, is in New York City conferring with officials of the company.

O. B. STEEN, field expert Southwestern Securities Co. of Los Angeles, Cal., has been examining mines at Searchlight, Nev.

W. F. COLLINS of Chicago, Ill., has been appointed manager Keystone-Holy Terror G. M. Co., working near Keystone, S. D.

C. E. LENTZ of Twin Bridges, Mont., manager Lentz G. & C. M. Co., has been attending a stockholders meeting at Pittsburg, Pa.

O. HERLOCKER has resigned as superintendent Highland mine, near Sumpter, Or., and will devote his attention to his own properties.

H. F. WELLS of Boston, Mass., and W. H. Stearns of Providence, R. I., have been examining the Lexington Hill mine, near Deadwood, S. D.

A. C. MASSAY has resigned as superintendent Model G. M. Co., McCabe, Ariz., to become superintendent Richenbar M. Co., Richenbar, Ariz.

C. D. ROOKLIDGE has been elected secretary and manager Nevada-Superior M. Co., operating in Antelope mining district, Humboldt county, Nev.

L. C. MONAHAN has been acting superintendent Mammoth mine, near Kennett, Cal., during the temporary absence of Superintendent A. P. Anderson.

J. C. FLESCHE has resigned from the Rhoderick Dhu M. Co. and will devote his time to managing the Pewabic Con. M. Co., operating in Russell district, Gilpin county, Colo.

P. KENYON has resigned as assistant superintendent Mazatl Copper Co.'s mines, Mexico, and has been appointed mine captain Zaruma mines, Zaruma, Ecuador, South America.

JNO. H. LEWIS of Portland, Or., has been appointed State Engineer for Oregon, for four years at \$2400 per year, to co-operate with the Federal Government in irrigation and reclamation work.

ERNEST McCULLOUGH, second vice-president Northwest Cement Products Association, has resigned as engineer Municipal Engineering & Contracting Co. of Chicago, to go again into private practice as a consulting engineer in Chicago. His specialties will be concrete work and municipal improvements.

### Books Received.

Bulletin 264 of the U. S. Geological Survey, "A Record of Deep Well Drilling for 1904," by M. L. Fuller, E. F. Lines and N. C. Veatch, is published as a guide for future drilling in the regions discussed and to give knowledge of the rock succession and structure.

"Proceedings of the American Institute of Electrical Engineers," Vol. XXIV, No. 5, May, 1905, presents papers and discussions on "Time Limit Relays," by G. F. Chellis, "Duplication of Electrical Apparatus to Secure Reliability of Service," discussion on "Line Construction for High Pressure Electric Railroads," and "High Pressure Line Construction for Alternating Current Railways," and "Limits of Injurious Sparking in Direct Current Commutation," by T. Reed.

Bulletin No. 19 of the North Carolina Geological Survey describes "The Tin Deposits of the Carolinas," by J. H. Pratt and D. B. Sterrett. The principal deposits are the Rose mine at Gaffney, South Carolina, and the vicinity of Kings Mountain, North Carolina. After describing the geological and mineralogical occurrence of these veins, the authors give a summary of the tin de-



posits of the United States and of the world, together with information on the metallurgy and use of tin. It may be obtained from State Geologist J. A. Holmes, Chapel Hill, N. C.

"Bi-Monthly Bulletin of American Institute of Mining Engineers," May, 1905. C. K. Leith gives "A Summary of Lake Superior Geology, with Special Reference to Recent Studies of the Iron Bearing Series;" J. E. Johnson describes "An Automatic Stock Line Recorder for Iron Blast Furnaces;" S. S. Wyer writes on "Gas Producer Power Plants," "The Testing of Gas Producers," and "Bibliography of Gas Producers;" L. Addicks speaks of "The Effects of Impurities on the Electrical Conductivity of Copper;" H. V. Pearce describes "Improved Method of Slag Treatment at Argo." Discussions on some former papers are published.

## Commercial Paragraphs.

THE new tire mill put in by the Chrome Steel Works at Chrome, N. J., is ready to commence rolling ring dies, roll shells, Huntington rings and Chilean rings and tires from solid chrome "admantine" steel ingots.

THE Homestake Co. of Deadwood, S. D., has placed an order with the Ingersoll-Sergeant Drill Co. for what is said to be the largest mine compressor in the world. It will be used to operate fourteen compressed air mine locomotives, it being the intention of the Homestake to displace the mules now used for underground haulage with these motors.

THE Navy Department has placed an order with the Ingersoll-Sergeant Drill Co. for a Class "GC" air compressor to be located at the Portsmouth, N. H., Navy Yard. The compressor has compound steam cylinders 19 and 35 inches in diameter, compound air cylinders 32 and 20 inches in diameter and 24-inch stroke. Its capacity is 2179 cubic feet of free air per minute.

THE Trump Mfg. Co. of Springfield, Ohio, report that they have just closed a contract with an electrical concern in Illinois for six of their largest vertical type turbines, this being a duplicate contract of one placed with them some time ago. They write: "When the above contract is finished we shall have supplied this company with twelve Trump turbines. A paper mill in Massachusetts has just placed orders with us for five of our largest size horizontal type turbines. We will also furnish an electric railroad in central New York a pair of our largest size horizontal wheels in steel case. The above orders, together with a large number upon which we are already at work, have our plant running to its full capacity."

THE Dearborn Drug & Chemical Works have signed a long lease for a suite of six offices, comprising the north-west wing, on the eighteenth floor of the new Barclay building, 299 Broadway, New York City. This gives a north, west and south view overlooking all of New York harbor, North river, shores of New Jersey, and uptown New York; one of most beautiful birds' eye views in the city. When visiting New York you are invited to call at the new Dearborn offices. The selection of this new location became necessary due to the great increase of business in exports, marine, and through the branch offices at Havana, Boston, Philadelphia, Buffalo, etc., all of which come under the New York office direct. It is the company's intention, within one year, to establish complete analytical laboratories at New York to relieve the Chicago laboratories of the marine and eastern work. Arrangements have been made with the owners of the building to provide suitable quarters for this purpose above the offices, with private stairs connecting same.

## Trade Treatises.

Bulletin No. 52 of the Crocker-Wheeler Co. of Amper, N. J., describes direct current railway generators.

"A Few Words About Electric Fans," is the title of bulletin No. 54 from the Crocker-Wheeler Co., Amper, N. J.

The Franklin compressors are finely illustrated and described in a booklet issued by the Chicago Pneumatic Tool Co., 1010 Fisher Building, Chicago, Ill., and 95 Liberty street, New York.

The Ingersoll-Sergeant Drill Co., 26 Cortlandt street, New York City, describe the use of their labor saving tools operated by compressed air in "Track Laying on the Williamsburg Bridge," Bulletin 2002.

The Chrome Steel Works of Chrome, N. J., G. W. Myers, Kohl Building, San Francisco, Cal., Pacific coast representative, have issued a neat brochure setting forth the use and merits of chrome steel in crushing machinery.

In "Cyanide Tank Equipment" the Redwood Manufacturers Co., 8 California street, San Francisco, Cal., have issued a catalogue valuable to every one interested in the cyanide process. Tanks, classifiers, filter bottoms, zinc boxes and lathes, valves and all machinery necessary for cyaniding are finely illustrated and described, the whole forming a practical treatise on the subject. The catalogue will be sent upon application.

The 108-page standard size (6x9 inches) catalogue of the Pelton Water Wheel Co., San Francisco and New York, is a good example of what such a trade treatise should be and a further exponent of what is possible in that direction. It is copyrighted, as it deserves to be, and contains so much of technical detail, practical information and general knowledge regarding water wheel construction and all incident thereto as to deserve a place on the desk of every one in any way interested in the subject.

## Latest Market Reports.

SAN FRANCISCO, May 26, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 27<sup>1</sup>/<sub>2</sub>d (standard ounce, 925 fine); New York, bar silver, 59<sup>1</sup>/<sub>2</sub>c, refined (1000 fine); San Francisco, 59<sup>1</sup>/<sub>2</sub>c; Mexican dollars, 47c, San Francisco; 45c, New York.

COPPER.—New York: Standard, \$15.00; Lake, 1 to 3 casks, \$15.00@15.00; Electrolytic, 1 to 3 casks, \$15.00; Casting, 1 to 3 casks, \$14.75@14.75. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: \$64 10s spot per ton.

The total visible supply of copper on May 1, 1905, as reported by James Lewis & Son of Liverpool, England, was 18,055 tons. A small gain has been made on the stock on hand owing to about 1200 tons of copper and matte which are held up by a strike of workmen at the Cape Copper Co.'s works and cannot be smelted. The total visible supply is larger than on April 1, 1905, by just about the amount thus held. The total supply has gained about 1200 tons since January 1 last, and is nearly 6000 tons greater than a year ago, but with the price considerably higher—£70 5s, as against £63 15s.

Following are the figures for the German consumption of foreign copper for the months of January-March, 1905, compared with the same period of time for 1904-1903:

	1905.	1904.	1903.
Imports, tons.....	24,668	29,624	19,590
Exports, tons.....	3,173	1,958	3,942
Consumption, tons..	21,495	27,666	15,648

Out of the above, 20,255 tons were imported from the United States.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12; San Francisco, \$3.70, carload lots; 4<sup>1</sup>/<sub>2</sub>c 1000 to 4000 lbs.; pipe 6<sup>1</sup>/<sub>2</sub>c, sheet 7, bar 5<sup>1</sup>/<sub>2</sub>c; pig, \$4.85. London: £12 5s <sup>1</sup>/<sub>2</sub> long ton.

SPELTER.—New York, \$5.55; St. Louis, \$5.70; London, £23 12s 8d <sup>1</sup>/<sub>2</sub> ton; San Francisco, ton lots, 6<sup>1</sup>/<sub>2</sub>c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.00@30.35; San Francisco, ton lots, 31<sup>1</sup>/<sub>2</sub>c; 500 lbs., 32c; 200 lbs., 32<sup>1</sup>/<sub>2</sub>c; less, 33<sup>1</sup>/<sub>2</sub>c; bar tin, <sup>1</sup>/<sub>2</sub> lb., 35@37<sup>1</sup>/<sub>2</sub>c. London, £136 15s.

PLATINUM.—San Francisco, crude, \$18.50 <sup>1</sup>/<sub>2</sub> oz.; New York, ingot, \$19.50 <sup>1</sup>/<sub>2</sub> Troy oz. Platinum ware, 75@82c <sup>1</sup>/<sub>2</sub> gram.

QUICKSILVER.—New York, \$38.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 <sup>1</sup>/<sub>2</sub> flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6<sup>1</sup>/<sub>2</sub>c; extra, 17<sup>1</sup>/<sub>2</sub>c; genuine, 32<sup>1</sup>/<sub>2</sub>c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

ZINC.—Metallic, chemically pure, <sup>1</sup>/<sub>2</sub> lb., 50c; dust, <sup>1</sup>/<sub>2</sub> lb., 10c; sulphate, <sup>1</sup>/<sub>2</sub> lb., .04c.

NICKEL.—New York, 55@60c <sup>1</sup>/<sub>2</sub> lb.; ton lots, 40@47c. ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c <sup>1</sup>/<sub>2</sub> lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.25@16.25; gray forge, \$16.00; San Francisco, bar, 3c <sup>1</sup>/<sub>2</sub> lb., 3<sup>1</sup>/<sub>2</sub>c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@25.00; open hearth billets, \$23.00@25.00; San Francisco, bar, 7c to 12c <sup>1</sup>/<sub>2</sub> lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6<sup>1</sup>/<sub>2</sub>c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 4c <sup>1</sup>/<sub>2</sub> lb. above keg price in 1 and 5-lb. tin cans, 100 lbs. per case, 4c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6<sup>1</sup>/<sub>2</sub>c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city <sup>1</sup>/<sub>2</sub> bbl. CEMENT.—Imported, \$2.15@2.65 <sup>1</sup>/<sub>2</sub> bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 <sup>1</sup>/<sub>2</sub> bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILES.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00@shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7<sup>1</sup>/<sub>2</sub>c; Hallett's, 7<sup>1</sup>/<sub>2</sub>c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9<sup>1</sup>/<sub>2</sub>c; 100-lb. lots, 10<sup>1</sup>/<sub>2</sub>c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitro-glycerine, per lb., in carload lots, 15<sup>1</sup>/<sub>2</sub>c; less than one ton, 17<sup>1</sup>/<sub>2</sub>c. No. 1\*, 60%, carload lots, 13<sup>1</sup>/<sub>2</sub>c; less than one ton, 15<sup>1</sup>/<sub>2</sub>c. No. 1\*, 50%, carload lots, 11<sup>1</sup>/<sub>2</sub>c; less than one ton, 13<sup>1</sup>/<sub>2</sub>c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9<sup>1</sup>/<sub>2</sub>c; less than one ton, 11<sup>1</sup>/<sub>2</sub>c. No. 2\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c <sup>1</sup>/<sub>2</sub> set; 14 oz., 40s., 9<sup>1</sup>/<sub>2</sub>c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c <sup>1</sup>/<sub>2</sub> lb.; carloads, 23@23<sup>1</sup>/<sub>2</sub>c; in tins, 30c; soda ash, \$2.00 <sup>1</sup>/<sub>2</sub> 100 lbs.; hyposulphite of soda, 3@3<sup>1</sup>/<sub>2</sub>c <sup>1</sup>/<sub>2</sub> lb.;

caustic soda, in drums, 3@3<sup>1</sup>/<sub>2</sub>c <sup>1</sup>/<sub>2</sub> lb.; Cal. s. soda, bbls., \$1.10@1.20 <sup>1</sup>/<sub>2</sub> 100 lbs.; sds., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6<sup>1</sup>/<sub>2</sub>@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2<sup>1</sup>/<sub>2</sub>@2<sup>3</sup>/<sub>4</sub>c; powdered sulphur, 2<sup>1</sup>/<sub>2</sub>@2<sup>3</sup>/<sub>4</sub>c; flour sulphur, French, 2<sup>1</sup>/<sub>2</sub>@—c; alum, \$2.00@2.25; California refined, 1<sup>1</sup>/<sub>2</sub>@2c; sulphide of iron, 8c <sup>1</sup>/<sub>2</sub> lb.; copper sulphate, 5<sup>1</sup>/<sub>2</sub>@5<sup>3</sup>/<sub>4</sub>c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1<sup>1</sup>/<sub>2</sub>@2c <sup>1</sup>/<sub>2</sub> lb.; nitric acid, carboys, 8c <sup>1</sup>/<sub>2</sub> lb.

OILS.—Linseed, boiled, bbl., 62c; cs., 67c; raw, bbl., 60c; cs., 65c; Lucol oil, boiled, bbl., 53c; cs., 58c; raw-bhl., 51c; cs., 56c. Kerosene—Pearl, per gal., 18c; As; tral, 18c; Star, 18c; Extra Star, 21c; Eocene, 20c; Elaine, 26c; Water White, in bulk, 11<sup>1</sup>/<sub>2</sub>c; Mineral Seal iron bbls., 18c; wooden bbls., 20<sup>1</sup>/<sub>2</sub>c; cs., 24c; Minera; Sperm, cs., 26<sup>1</sup>/<sub>2</sub>c; Deodorized Stove Gasoline, hulk, 15<sup>1</sup>/<sub>2</sub>c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphta or Benzine, deodorized, in bulk, per gal., 12<sup>1</sup>/<sub>2</sub>c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 65c; cs., 70c; Neats-foot Oil, pure, bbl., 63c; cs., 68c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; W bale Oil, cs., 53@68c.

BORAX.—Concentrated, 6@7c <sup>1</sup>/<sub>2</sub> lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c <sup>1</sup>/<sub>2</sub> lb.; No. 1, 4@5c. LITHARGE.—Pure, in 25-lb. bags, 8@9c <sup>1</sup>/<sub>2</sub> lb.

MOLYBDENUM.—Best, \$2.75 <sup>1</sup>/<sub>2</sub> lb.

CHROMIUM.—90% and over, <sup>1</sup>/<sub>2</sub> lb., 80c.

PHOSPHORUS.—American, <sup>1</sup>/<sub>2</sub> lb., 70c.

SODIUM.—Metal, <sup>1</sup>/<sub>2</sub> lb., 50c.

BISMUTH.—Subnitrate, <sup>1</sup>/<sub>2</sub> lb., \$2.10.

URANIUM.—Oxide, <sup>1</sup>/<sub>2</sub> lb., \$3.50.

MERCURY.—Bichloride, <sup>1</sup>/<sub>2</sub> lb., 77c.

TUNGSTEN.—Best, <sup>1</sup>/<sub>2</sub> lb., \$1.25.

SILVER.—Chloride, <sup>1</sup>/<sub>2</sub> oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, <sup>1</sup>/<sub>2</sub> lb. 7c; less than 500 lbs., 7<sup>1</sup>/<sub>2</sub>c.

MANGANESE.—Black oxide, <sup>1</sup>/<sub>2</sub> lb., 2<sup>1</sup>/<sub>2</sub>@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads <sup>1</sup>/<sub>2</sub> 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, <sup>1</sup>/<sub>2</sub> ton 2000 lbs. in 125-lb. hags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 16, 1905.

790,018.—GAS ENGINE—G. A. Aldrich, San Francisco.  
790,019.—FLUID MOTOR—G. A. Aldrich, San Francisco.  
790,022.—ROASTING ORES—Anker, Watson & Evans, Los Angeles, Cal.  
789,784.—VEHICLE—C. P. Balch, Dufur, Or.  
789,808.—FRUIT PITTER—J. S. Briggs, Los Angeles, Cal.  
790,027.—SQUARE—L. Brodt, Berkeley, Cal.  
790,029.—HARP—J. P. Childs, Spokane, Wash.  
790,035.—TREATING MOLASSES—F. Deusy, San Francisco.  
790,036.—REFINING SUGAR—F. Deusy, San Francisco.  
790,117.—VISE—K. L. Erickson, Park, Wash.  
789,849.—COAL FEEDER—G. W. Gardner, San Francisco.  
790,120.—NEEDLE—D. E. Garrett, Berkeley, Cal.  
790,046.—CAISSON AND TUNNEL—P. J. Gilden, San Francisco.  
789,852.—RAVELING MACHINE—O. C. N. Gunderson, Spokane, Wash.  
789,973.—CUT OFF SAW—C. A. Hartman, Hoquiam, Wash.  
789,789.—HEATING LIQUID FUEL—F. W. Jackson, Needles, Cal.  
790,021.—GAS ENGINE—N. L. Rigby, Garvanza, Cal.  
790,117.—VISE—K. L. Erickson, Park, Wash.  
789,980.—TIRE SHIELD—J. Marsden, San Francisco.  
789,926.—FLUSHING DEVICE—F. H. Mason, Spokane, Wash.  
789,995.—WHEEL—D. C. McCan, Nordhoff, Cal.  
789,929.—LATCH—E. North, Los Angeles, Cal.  
789,874.—REVOLVING TRACK—H. N. Owen, San Francisco.  
789,881.—PRINTING PRESS—P. F. Rice, Tustin, Cal.  
790,078.—VIBRATOR—N. L. Rigby, Garvanza, Cal.  
790,158.—SWITCH—W. H. Sammons, North Bend, Or.  
789,889.—BUTTER CUTTER—E. Sutherland, Los Angeles, Cal.  
790,163.—POCKET TRANSIT—W. D. Verschoyle, Seattle, Wash.  
789,947.—DITCHING MACHINE—M. A. Wheaton, San Francisco.  
790,241.—TELEPHONE MOUTHPIECE—W. Wright, San Francisco.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

DITCHING MACHINE.—No. 789,947. May 16, 1905. Milton A. Wheaton, San Francisco, Cal. This invention relates to an improved machine for digging ditches, trenches and the like. Its particular object is to provide a portable machine of this character adapted to operate efficiently in swampy or marshy land, and in soft or clayey or sticky soils, as well as in dry ground, and which may be propelled and operated by its own power. It consists in the combination of a suitably supported hollow cutting device comprising a plurality of circumferentially arranged cutting blades directing material into the interior of the cutter, means for moving it on lines transverse to its axis of rotation and conveyer means operating with the cutter.

PNEUMATIC TIRE SHIELD.—No. 789,986. May 16, 1905. Joseph Marsden, San Francisco, Cal. This invention relates to means for protecting pneumatic tires from puncture and at the same time maintaining the resiliency of such tires under the varying pressure of loads and shocks. The object of the invention is to provide a protecting envelope or casing surrounding that portion of the tire which is subject to puncture or abrasion, and to so connect the free edges of the casing with supporting parts that the casing itself will partake of the compressions and extensions of the inclosed tire under loads, and thus allow the air within the latter to exercise its full resilient action under compression and expansion. It consists of a shoe inclosing the outer periphery of the tire having its edges free, springs having the outer ends connected with said edges at intervals, swiveled attachments for the inner ends of said springs, and means for securing said attachments to the wheel spokes.

SEPARABLE SQUARE.—No. 790,027. May 16, 1905. Lincoln Brodt, Berkeley, Cal. The object of this invention is to provide a square which shall have its branches separable one from the other to allow it to be packed or carried in a small compass, and which shall be simple in construction and thoroughly practical in operation. The device comprises two separable members, one of which is grooved and the other provided with a corresponding tongue having side and end abutments, said members having a coincident wedge-shaped aperture, a wedge removably fitting said aperture and means for operating the wedge to lock the grooved member in contact with the abutments of the tongue member.

PROCESS OF TREATING MOLASSES.—No. 790,035. May 16, 1905. Felix Deusy, San Francisco, Cal. The object of the present invention is to produce a comparatively high minimum density, and consequently a high osmose in the molasses during the osmose period, and thereby effect at a single operation the elimination of a larger quantity of salts than is possible under ordinary methods and with ordinary apparatus, increase the yield of sugar in the osmose molasses, and decrease the quantity of sugar lost in the exosmose liquid. It consists in a process of flowing the initial molasses and the osmosing-water in opposite directions to cause one to pass the other, and adding to the liquid undergoing osmose a part of said liquid which has already been osmose and concentrated.



# MINING AND SCIENTIFIC PRESS

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## Life on the Yukon.

With each return of the summer season the interest in mining in Alaska and the Yukon region takes on new life. It is then that the venturesome spirits—such as those who have opened up that land of ice and snow and made life endurable there—turn their faces in that direction in search of fortune. It is owing to this spirit that every vessel from now on going northward from the Pacific States to Alaskan ports will be crowded with passengers and freight. Since the discovery of the rich gold deposits in the Yukon basin numerous towns have come into existence and many thousands of people now winter in the Far North, but little removed from the Arctic circle. Dawson, Forty-Mile, Eagle, Rampart and Fairbanks are all within 100 to 200 miles of the circle, and Fort Yukon is directly on the Arctic circle, at the most northerly point reached by the Yukon river. From there it flows southwesterly into Bering sea. Although the Yukon rises in British territory, only a few tributary streams heading in Alaska, the greater part of the length of the river flows through Alaska—the stream crossing the international boundary at Eagle City. The Tanana also heads in the Yukon Territory, but the greater part of it is in United States possessions.

Mining outside for placer gold is mostly carried on during the months from June to October. Those wintering in the country have, of course, the advantage of an early start, as transportation is not open until after mining operations are possible in the interior. During winter the miners work in their claims, drifting out the frozen ground by the use of "steam points." These are pipes drawn to a point and perforated with small holes. The pipes are driven into the gravel and steam turned in from a boiler located on the surface. Many schemes for thawing the frozen ground have been tried, but the steam point has proven the most economical and satisfactory. The gravel, softened by the steam, is sent to the surface and dumped. In this manner large piles of gold-bearing gravel are accumulated, to be washed the following summer when water is available.

The accompanying engravings will give a good idea of the life of a miner on the rivers. During winter the streams are frozen solidly to a considerable depth and some of them to the bottom. Traveling on the ice by means of sleds drawn by horses or dogs is the usual method of moving about and is the least expensive means of transporting freight of any description. As summer approaches the snows soften, the ice becomes slushy and for a time travel is practically at a standstill. Soon, however, the warmth of the sun, which increases with the growing length of the days, causes the streams to flow. The



Traveling on the Ice on the Yukon.



Preparing to Go Down the River on Breaking Up of the Ice on the Yukon.

ice breaks up and floats away. Often at some point, usually at a bend in the river, the ice forms a jam and the floating ice from up the river, continuing to come down, increases the obstruction rapidly, causing the water to back up over a considerable area, until it either overflows the barrier of ice and carries it away or cuts for itself a new channel across the low flats adjacent to the river. This is reported to have happened within a month near the town of Fairbanks. The details of this incident have not yet reached the outside world. When the rivers

are free from ice the prospectors can go up or down the stream in boats or canoes, and those desiring to go up stream often improvise a vessel in the form of a small raft, which they "pole" or paddle in the direction they wish to go. One of the engravings shows two men thus sailing in their ship of fortune. Another gives a view of several larger rafts and scows, some of which are covered with tents or tarpaulins as a protection against the changeable weather. They are waiting for a clear river. A fourth view shows one of the larger scows.



Prospectors Rafting Down the Yukon.



Rafting on the Yukon.



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**A** LACK of water in the new district of Goldfield, Nev., is interfering seriously with the plans of milling ores in the district. The water is obtained from comparatively shallow shafts, and there is little doubt the water supply will be increased by sinking deeper. When water is obtained so close to the surface it is usually found in increasingly greater amount in depth. Water has been found in this district unusually close to the surface for the desert region—65 to 205 feet. If water is not obtainable in sufficient amount from the neighboring mines, it is safe to say that the energy and enterprise of the mine owners of that camp will provide water from some more distant source.

**Z**INC tailings are proving a source to wealth of the mines of the Barrier range, in New South Wales, the Broken Hill Proprietary mines having demonstrated that the long despised zinc ores which occur so abundantly at Broken Hill can be treated successfully and that company is making a commercial success of their treatment. The British Broken Hill Company now fall in line and are constructing a plant on lines similar to that of the Proprietary Company and will treat their tailings, over 300,000 tons of which have accumulated there. The former company had been using these tailings to fill mine stopes, and this filling they now intend to attempt to withdraw—with what success remains to be seen. It is stated that the tailings contain about 17% zinc in the form of blende, which will repay the cost of recovering the metal from these ores once they are again on the surface. The mining methods adopted in recovering these tailings will be of interest.

**I**N no section of the country is the leasing system so extensively employed as in Colorado. It has made it possible to profitably work a large number of mines which under corporate management would be failures financially. It is because of the extraordinary expense of corporate management. Under the leasing system everything is done in a matter-of-fact, practical way. There are no "frills" and no high-priced managers; no heavy and unnecessary foreign

office expenses. The success of the leasing system in that State affords much food for thought when contemplating some of the larger corporate enterprises. In at least one instance where a corporation reserves to itself the richest part of its property and works it—at a loss—the poorer portion is given over to leasers, who pay a good royalty and make a handsome profit for themselves. Further comment on the two systems of mine operation seems unnecessary.

## Penalty for Misrepresentation.

In England, as well as in the United States, much attention is given by the investing public to the capacity of a mining concern to earn dividends on a stated capital, the same as if it were a railroad or a manufacturing enterprise. Indeed, to such an extent is this fallacious idea carried out by promoters and others that mines are not infrequently spoken of in glowing terms as "manufacturing enterprises"—great industries where gold, or copper, or some other metal is manufactured. A moment's thought will indicate how unsound such reasoning is. A manufacturing enterprise may endure and increase its volume of output for years, and even for generations, for there are many such enterprises founded several generations back that are still in successful operation, engaged in manufacturing—where the raw materials of one season's operations are replaced the next with new, and the industry continues to thrive and expand throughout a long period of years. Its only limitations are the ambition of the management and the ability and willingness of the market to absorb what is thus produced.

In these lines there is always severe competition, and this, together with the limitations of the consumption, are practically the only restraints placed on the expansion of a manufacturing enterprise. With mining it is entirely different. Its possibilities, however great, are really limited by the amount of ore actually available and which may be extracted and the values recovered at a profit. There are mines which have been successfully operated for centuries, producing in the aggregate millions in value. The tin and copper mines of England are instances. Then there are mines which within a score of years of their discovery have produced more value than all the tin and copper mines of Cornwall throughout their entire history of centuries of active operation. The Comstock furnishes numerous examples of this latter class. There is a third class—great mines, not inexhaustible by any means, but long-lived, profitable and looked upon as among the safest of industrial investments, which they undoubtedly are. The Homestake, Alaska-Treadwell, Mount Morgan, Broken Hill and other similar great mining enterprises are excellent examples of this class. The famed copper mines of Lake Superior are in still another class. They have been profitably worked for many years, and some of them promise to continue for many years to come. Few mines in the world have on the whole made so large profits from original investment. The Calumet & Hecla leads the world in this regard. On a capitalization of \$2,500,000 this company has disbursed in dividends exceeding \$85,000,000.

This brings the proposition fairly before us. What actual relation does capitalization of a mining corporation bear to its real value? In most cases, it may be safely said "none at all." In contradistinction to the career of Calumet & Hecla may be taken any one of a score of properties capitalized at figures ranging from \$1,000,000 to \$20,000,000 that have never paid a dividend and never will, because they do not possess the elements essential to a dividend-paying proposition. It must be acknowledged that, in fact, a mine only is capable of producing what may be contained within it—the ore actually existing within the entire limits of the property, whether this may be recovered at a profit or not. If the mine is a dividend payer, the question naturally arises, "how long will the dividends continue and in what amount?" Upon this basis—the real possibilities of the mine—should the valuation be made, and not upon its ability to keep up these dividends indefinitely. A mine may be able to pay \$25,000 per month with a 40-stamp mill. This is \$300,000 per annum—6% on \$5,000,000. If the mill capacity be enlarged to eighty stamps, it is reasonable to assume that the dividends will be increased to \$50,000 per

month. Does this make the property worth \$10,000,000? Some argue that it does for the reason that it is 6% on \$10,000,000. The fact may be that the mine may never be able to pay dividends longer than five years with a 40-stamp mill, or \$1,500,000 net, instead of \$5,000,000. This in no manner detracts from the real value of the mine. The mine itself, under proper management, will pay just as much in dividends with a capitalization of \$100,000 as it will if capitalized at \$20,000,000.

It is due to a lack of knowledge on the part of the investing public in mining affairs, practical and technical, that unscrupulous promoters and others are enabled to take an unfair advantage of the people. Prospectuses and annual official reports teem with misleading and untruthful statements, but the public, being unfamiliar with the business of mining, are not discriminating, and invest in enterprises having no real merit or pay too much for stocks in those which have actual value and are dividend payers.

In England the Government has undertaken to protect the investor by passing a law making certain misstatements concerning a mining company's financial affairs criminal. Two amendments have recently been made to the existing law, as follows:

1. If any person, being a director, manager, secretary, or other officer of any company, or being the auditor of the company, whether an officer or not, wilfully circulates, publishes, or makes or prepares for circulation or publication, or concurs in so circulating, publishing, making or preparing any written statement or account relating to the financial affairs or property of the company which he knows to be false in any material particular, he shall be guilty of a misdemeanor, and shall be liable on conviction on indictment, to imprisonment, for a term not exceeding two years, or in the discretion of the court, to a fine not exceeding £500.

2. For the purpose of this section the expression "company" includes any company formed for the purpose of gain and incorporated by charter, or by or under any Act of Parliament, and any friendly society, whether registered or unregistered, and also any society or body of persons (or other than a friendly society) which is registered by or with the Registrar of Friendly Societies, under any Act of Parliament.

This new Act will be known as the "False Statements (companies) Act."

If the law were extended to include untruthful statements concerning the actual value of the property it would be more complete. There seems to be as much need of a law framed along these lines in America as there has been in England. Mines cannot be developed without money, and the spirit of speculation which is naturally in the people makes some of these undeveloped mining propositions attractive, but the facts should be told concerning the property, not falsehoods. Then if the public loses on a "flyer," they have nothing but their own cupid-ity to blame.

## A Caved Mine.

The recent disastrous cave reported as occurring in the United Verde mine workings, at Jerome, Ariz., illustrates in a forcible manner the short-sighted policy of "cheap" extraction of large bodies of ore, even if in hard rock, without filling. There are many large mines where the good-standing qualities of the ore and wall rocks lead the management to adopt a system of mining which must ultimately result in disaster. The removal of hundreds of thousands of tons of ore from a large vein or deposit, and the attempt to support the walls and overhead ore by means of timber must have a limit even in the best standing ground. It might be permissible for a single stope to be excavated, and the roof and walls supported by a system of timbering without filling. When a series of stopes, one above another, are thus opened, with only shell-like intervals of rock between levels, an element of danger is introduced which should be avoided, but having been created should receive prompt and proper attention, or, as in the case of the United Verde, the ultimate cost may perhaps exceed that of the application of the proper methods in the first place. It is simply another object lesson in mining, teaching the observer how mining should not be done. As a result of this short-sighted policy the United Verde mine is practically closed. The buildings are settling, and it is said the shafts and foundations of the hoists are so much out of line that no hoisting can be done, and it may be several weeks, if not months, before active work can be resumed.



## CONCENTRATES.

"HIGH-GRADING" is a term recently come into use in Colorado to signify the theft of high-grade ore.

UNDERHAND STOPING is only advisable on small and unusually rich veins. It is not commonly practiced in the United States.

CHARCOAL is used to precipitate gold from chloride solutions at the reduction works of the Mount Morgan mine, Queensland, Australia.

WHERE a contract is signed by only a portion of the owners of a mine, the Supreme Court of California has decided that such a contract is not binding.

ARKOSE ROCKS are those formed from the disintegration of granites. They are fragmental rocks, but in composition resemble the granite from which they are derived.

MANGANESE usually occurs as black oxide in several minerals, notably pyrolusite and psilomelane. The carbonate and silicate are also abundant in same localities, but the sulphide alabanite is rare.

"GRUB-STAKE CONTRACTS" need not necessarily be reduced to writing, as they do not come within the statute of frauds. The grub-stake contract is similar to what is legally termed "qualified partnership."

THE Sierra Pintada placer mines are in Lower California. They were discovered in 1899 and a small stampede followed, but, as pointed out in these columns at that time, the extent and value of these diggings were greatly overstated.

THE Yellow Jacket shaft was the first deep vertical shaft sunk at the Gold Hill end of the Comstock Lode, Nevada. It was several thousand feet east of the shafts in the town of Gold Hill. Since that shaft was sunk the Forman and Combination were sunk far east of the line of the Yellow Jacket shaft.

TO PROPERLY SUPPORT the soft walls of a vein after stoping where no filling is cheaply available, heavy plates (3-inch plank) should be placed between the timber and the wall. If this method does not afford sufficient support, posts must be used as well as stulls, thus forming a sort of square-set system.

IGNEOUS rocks, originally hard and flinty, sometimes become softened by decomposition of the feldspars. The so-called "white porphyry" of Leadville, Colo., is of this character. This rock was originally a hard dense quartz porphyry. It is now comparatively soft, from the decomposition of the feldspars, which have become kaolinized.

WHEN opening a mine by extensive open pits, if there are underground workings below these pits, provision must be made for their drainage, and the greater the superficial area of the open cuts the more water they will collect and send into the underground workings, unless the necessary provision be made to drain the water away.

FIRE clay is often found beneath coal seams and veins. They are comparatively free from alkaline earths, as these have been largely or wholly removed by pre-existing vegetation. Any substance which has a tendency to render the clay fusible should be sought for, as these render the clay useless for the manufacture of refractory materials.

WHERE large dumps of either waste rock or tailings have to be handled, some expense can be saved by improvising light, portable chutes, up to which the cars can be run and the material scraped or shoveled into it. By a proper arrangement of this kind the cost of handling can be reduced one-third to one-half that of shoveling from the floor.

WHERE porous rock contains a low grade of copper, say about 2%, in the form of carbonate the metal may be recovered by leaching the copper out of the crushed ore by means of a dilute solution of sulphuric acid and precipitating the metal on iron or tin scraps in boxes. The resulting precipitate is an impure copper, which is collected, dried and sacked in canvas bags and shipped to a refinery if no smelting furnace is at hand, in which it may be treated.

IN the matter of alien ownership of property, Nevada law provides that any non-resident alien, person or corporation, except subjects of the Chinese Empire, may take, hold and enjoy any real property (mining claims are real property), or any interest in lands, tenements or hereditaments within the State of Nevada, as fully, freely and upon the same terms and conditions as any resident citizen, person or domestic corporation. The law does not state that a resident Chinese subject may not hold property in Nevada. A Chinese born in the United States is a citizen in the eyes of the law. The question as to the status of the Chinese resident of Nevada, as a part owner of a claim, involves many con-

siderations not within the scope of the mining law. It seems a case for settlement in the courts, as undoubtedly the Chinaman had a right to hold the one-third interest deeded to him by the locator for a consideration—the assessment work.

PLACER MINERS everywhere should carefully save the black sands which are recovered from the sluice boxes at the time of making the cleanup. In many districts these sands are valuable—in some for gold contained, in others for platinum and in others for the rare earth minerals, such as monazite. Systematic and thorough tests of black sands are to be made this year at the Portland, Or., Exposition, and much valuable information will be obtained as to the character of the black sands.

"STINKERS" are charges of nitro powder which burn instead of exploding. The name given by the miners to this sort of occurrence is more descriptively forceful than elegant. They are usually caused by placing the detonating cap too far down in the charge, and, in consequence, the communication of the fire from the interior of the fuse to the powder, which burns, filling the mine workings with obnoxious and deadly gases. "Stinkers" can generally be avoided if the fuse and cap are properly arranged and not placed below the first stick of powder used.

THE railroad extension from the former terminus of the Peruvian railroad at Oroya to the mines at Cerro de Pasco was built primarily to aid in the further development and operation of the old mines at the latter place, which were formerly great producers of silver, but are now being worked for copper by J. B. Haggin & Co. of New York. The road is 82 miles in length. The altitude at Oroya is 12,250 feet and at Cerro de Pasco is 14,200 feet, which is higher than any mining camp in America. The maximum grade is  $2\frac{1}{2}\%$ —about 220 feet to the mile—and the maximum curve  $16^\circ$ . The rails are of 70-pound steel. It is one of the highest railroads in the world.

THE occurrence of an iron cap or gossan is not always a safe indication of the existence of bodies of copper ore beneath, though copper deposits not infrequently have a capping of iron oxide, silica and lime. Some copper vein outcrops contain barely a trace of copper, others are rich in oxides and carbonates. The climatic conditions, and to no small extent, the topography of the country, have a marked influence on the superficial portions of copper veins and deposits. Copper glance does not always intervene between the zone of carbonates and of the normal sulphides below, though this is characteristic of some localities, particularly Butte, Montana.

THE gold-bearing streams of the mountains of California have mostly been worked out long since, at least such portions as would pay by the ordinary methods in use. The gold has been recovered by sluicing; by the use of the hydraulic elevator; by turning aside the streams, sometimes by means of flumes, and occasionally by diverting the water through a tunnel, thus making it possible to drain long stretches of bedrock, and to recover the gold. Dredging has been attempted to a very limited extent in the mountains as the streams are all torrential, and any scheme for working the beds of these rivers must be carried out during the low stage of water, as the freshets of spring usually sweep every obstruction away.

MINING claims in California are located under the Federal law. The annual assessment work must be done as required by the United States Statutes. If a vein outcrops on an agricultural patent, such a vein has no extralateral right. That is, the owner of the land is not permitted by the law to follow the vein downward beyond the side line of the agricultural claim. If a shaft be sunk outside of the patent to reach the vein, the discovery so made, if on unoccupied public land, might be called an apex, for legal purposes, and the courts would no doubt so construe it, admit the validity of such discovery and grant to the discoverer all the privileges to which he would be entitled if the discovery were made on the surface.

CONSIDERABLE experimenting has been done in Canada in the concentration of molybdenite, and a varying degree of success has been attained by the several methods tried. Among these are electro-magnetic separation and some of the several forms of shaking-table concentrating machines. Enough has been done along these lines to show that each particular ore offers a separate proposition in concentration, and until each is tried the result that may be obtained on any given ore is an experiment and separate tests are necessary in each case. Jigs have been tried, but did not give satisfactory results. The ore should preferably be crushed by rock breakers and rolls, stamps being undesirable for this purpose.

THE pressure at the in-take of a syphon per square inch is exactly that of the atmospheric pressure at that place and time. The in-take end does not require to be immersed several feet, but just below the surface of the water—sufficiently to exclude air from the syphon. The principle upon which the syphon operates is this: If both legs of the syphon be filled with water, both ends having been stopped and the shorter leg immersed a

short distance in a body of water, if the stoppers be removed, the water in the longer leg having greater weight than that in the shorter leg begins to flow out. This has a tendency to create a vacuum in the pipe, but this tendency is immediately counteracted by the pressure of the atmosphere on the surface of the reservoir, which will cause a column of water to rise in the pipe equal in weight to the atmosphere present. This at sea level is a column about 33 feet in height, and in the mountains proportionally less as the pressure of the air grows less with increasing altitude. The height to which water will rise in a syphon is always somewhat less than that theoretically calculated due to the pressure of the atmosphere.

MOLYBDENITE may be recognized by the following properties: It occurs in bright metallic scales, brighter than pure graphite; flexible but not elastic; soft, easily soiling the fingers or a paper; when heated gives off sulphur fumes, and before the blowpipe held in the forceps colors the flame yellowish-green; infusible; decomposed by nitric acid, leaving a white or grayish residue. To detect the presence of molybdenum in its ores, pulverize the sample to a fine powder and place in the lid of a platinum crucible resting on a triangle. Add a few drops of concentrated sulphuric acid and stir. Heat, and dense white fumes are given off. Cooling, and breathing on it repeatedly, the vapor becomes a decided and beautiful blue. The blue coloration disappears on reheating, but returns on cooling. If water be added it disappears.

QUARTZITE is a compact, crystalline, granular aggregate of quartz, either in irregular, crystalline grains or in developed crystals. Quartzites are the result of the consolidation of what were originally sandstones. In certain districts the quartzites have been silicified by the infiltration of silica, and there has been a secondary enlargement of the quartz grains by the formation of an envelope of silica about each individual grain. This infiltrated silica has assumed a crystalline form. The polarization microscope shows that each separate grain is enveloped in this foreign silica, and usually the outline of the original grains can be distinctly traced. Sandstones also are sometimes cemented by iron, lime or clay, but these are not, strictly speaking, quartzites—but sandstones. Mica sometimes develops in sandstones and quartzites, giving the rock a schistose appearance.

IN the early years of gold mining in California and for many years thereafter only raw copper plates were used as collectors of amalgam. The silver-plated copper plates were introduced twenty years or more ago. For the best results the plates should receive a heavy coating of silver. The use of pure silver plates has been suggested, but it is unlikely the suggestion will be extensively followed owing to the cost. If the plates are made thin they are likely to bend, which, producing an uneven surface, is unsatisfactory, and if sufficiently heavy to resist warping the plate becomes too expensive. Copper plates which have been properly electro-plated with silver have been found to answer every requirement. If the gold in an ore is readily susceptible of amalgamation the amount of gold in the ore must be small if it will not deposit a substantial film of gold amalgam on the plates.

IN MINING the timbers employed in the various kinds of work have each a distinctive name. Thus, in shaft timbers, the main members adjacent to the walls are called wall plates; those at the end, end plates; the uprights at each corner, and sometimes in intermediate positions, are posts or studdles; the timbers dividing the shaft into two or more compartments are dividers or center braces. In the square-set system, the members lying upon the floor of the level are sills; the upright vertical pieces are posts; the pieces extending in sections between foot and hanging walls are caps; pieces reaching from the hanging wall to the second post from the wall are called butt caps; pieces reaching from a post to the foot wall and lying in a hitch are called cap sills. The members reaching from post to post and lying longitudinally of the vein are ties. Some improperly call them sprags. Pieces extending upward diagonally toward the hanging wall are angle-braces. In narrower stopes, timbers reaching from wall to wall are called stulls. If pieces are put in between the stulls, to make them more rigid, these pieces are called sprags. Sprags are also used in drift sets. They reach from post to post, at the sides of the drift, near the top, and are to overcome a tendency of the sets to "ride." In drift sets, the uprights are posts, the pieces extending across the drift from post to post are caps. Pieces placed above the caps, and separated from them by wedge-shaped blocks, are called bridges, and are to facilitate in driving the narrow strips overhead called lagging. A piece reaching across the drift and extending beneath the posts is a sill. In addition to the above, there are hanging-wall plates, foot-wall plates and props (usually specially placed.) In shafts there are also skids for tracks and guides for cages and skips, and in some shafts at stated intervals heavy timber called reachers are placed, the ends of which rest on hitches cut in the rocks. The function of these timbers is to take the weight of the timbers in the shaft, or at least to render them more secure. There are few full shaft sets that weigh less than 2000 pounds per set, and many weigh much more than this. The reachers take the weight in case the wedges become displaced or shifted and thus render the shaft more secure.



## Thirty Days of a Mining Engineer's Life in Mexico.

Written for the MINING AND SCIENTIFIC PRESS by  
E. A. H. TAYS.

Upon returning from a trip into southern Mexico I found a letter requesting a report on a certain United States company's mines in the State of Durango, near the city. The letter stated: "Our mines are but twelve hours ride from the city and two days from Mazatlan," and the parties advised me to go via Mazatlan, as they were in a hurry for the report.

Mazatlan happens to be seven days hard riding from Durango, under auspicious circumstances, and as the season was a bad one, and as no steamer was due at my nearest port for several days, I decided that "the long way round was the shortest way—," and took the stage north to Guaymas, going around via Benson, Arizona, and El Paso, Texas, calculating to reach Durango in seven or eight days; but our calculations often fail.

I left Fuerte, Sinaloa, on the evening of March 6th, taking the stage for Alamos, Sonora, a night's ride. As the river had been "up" for over a month, the stage could not cross, so passengers and mail had to cross the river in a canoe. I secured my ticket and took myself and baggage—consisting of a roll of bedding and a camp cot, a telescope valise and a canvas bag containing my saddle—down to the river early, and crossed over nearly an hour before the stage started. At the river bank the man in charge of the boat informed me that no charge was made for stage passengers, but if the passenger desired to "tip" the boatman, there was no objection. He was fairly well "boozed" up and, after imparting the above information, "struck" me for a dime. I produced the dime and he started up the bank for the town. Fearing he might delay, I induced him to ferry me across at once, which proved to be a good move on my part.

Once across, I sat on my baggage for about an hour waiting for the stage to come down for its load. In due time it came, and in the meantime, on the opposite bank of the river, had gradually collected rather a heterogeneous load for the canoe. Besides some eight or ten sacks of mail were six men, two boys, two pack saddles and other things; and, on either side, held by ropes, swam two burros. Some difficulty was had at the start, but finally boat and burros started together and, the stream being swift, and three of the men rather drunk, several times it looked as though the craft would capsize, and I congratulated myself on being on shore, and on the "safe" side.

The canoe finally landed a couple of hundred yards below where we were, so I was loaded into the stage and we drove down and secured the balance of our load.

The stages on the west coast of Mexico are of the

lady passenger inside, where she stayed until put down at a little house on the outskirts of Alamos, where we arrived about 7 A. M. of the 7th.

At the stage office I hired two men to take my baggage over to the Yaqui River stage line office and arranged for my passage at once. As they allow only twenty-five pounds of baggage, I had to pay \$10.80 for the 150 pounds of extra weight. I found the stage left at 12, so went to a nearby hotel and went to bed, sleeping for about two and one-half hours.

Feeling somewhat refreshed after my sleep, I attended to some business, and about 11 o'clock had something to eat, as I was hungry, having eaten nothing since the day before at one of the stage stations.

At 12 sharp we left Alamos, making Navojoa, on



Works at La Teresa Mine, Sinaloa, Mexico.

light, sweet bread handed it to the tramp, with the remark: "If you are hungry, eat this. I gave you a half dollar the other night and saw what you did with it, and will give you no more money." The fellow, taken by surprise, took the bread with profuse thanks and took a bite of it, but he had not taken his outraged stomach into account, for, after making a few chews, he turned around suddenly and spat it out in evident disgust. At this we each gave the fellow a dime and told him to go off and get a drink. Such is life!

It had been threatening rain all day and early that night it turned loose in earnest; and, no stage from the north arriving, we were obliged to wait. It rained all day and all the next night. About midnight the northern stage arrived and was to return at 9 A. M. My newspaper friend remained for a more propitious time, but an agent of the Singer Sewing Machine Co., a Mexican, and I decided we would go.

The Mayo river was up and rising rapidly. Of course the stage could not cross, so the mail (some ten sacks) and we had to cross in a canoe. This proved to be a good one, handled by two stalwart Mayo Indians.

We walked to the river in the mud and rain, while a native took our baggage in a wheelbarrow. At the river the stage driver yelled across to tell the passengers that the roof of the wagon (the stage had been replaced by a light Studebaker wagon with a canvas top) leaked and for them not to come. The passengers, however, had decided to take their medicine and went. We sat in the open boat in the rain while being ferried across and were glad to get under the canvas cover, which we found did not leak.

The wagon had but scant room, and after all the mail sacks and our baggage had been stowed away, there was small space for the two passengers, and knees and heads were close together. It was well that our newspaper friend stayed behind, for the wagon would not hold a peck measure more.

We started in a pouring rain, with mud 6 inches deep everywhere.

By 2 P. M. we made the first relay station and at 6 P. M. the second, where we stayed over night, sleeping under an open porch and making a supper of beef tamales, straight.

I had taken the precaution to lay in a basket of provisions before starting, so we ran no risk of going hungry.

The next day we made an early start, reaching Cocorit, on the Yaqui river, and a military post, at about 10 A. M. Here my "Singer" friend left me but another passenger, a young ranchman, took his place; and, to add to our comfort, the agent gave passage to a man, his wife, and a small boy, all of whom had to perch themselves on the baggage between the two seats. It can be imagined we were comfortable.

From Cocorit down the Yaqui river the roads were in better condition and we made good time in spite of our load to Chunampaco, a fort on the river where the road crossed it and where the Government has a



Pack Train Leaving Rosario for La Teresa Mines.



Entrance to La Teresa Mine, Sinaloa, Mexico.

heavy Concord type with seats for nine persons inside, but, as mail and other freight is profitable, it is given the preference; and, once loaded, the passenger piles himself away as best he can, often finding no room for his feet.

After much fussing we started, and I found that a young Mexican, bound for Alamos, was my only companion; and by maneuvering properly we managed to locate ourselves decently.

A few miles out we took on another passenger, a lady, who took her seat with the drivers.

My companion proved to be an employee of one of the city offices and seemed to think that the proper way to put in the night was drinking mescal and smoking cigars. Perhaps he was right; for by midnight the mescal had made him oblivious to knocks and jolts while I remained awake all night.

The roads are, as a rule, rough and unkept, and as the stage is driven at a good speed the passenger gets his money's worth, often getting seasick from the continued rocking and bouncing of the coach.

About daylight it started to rain, which drove the

the Mayo river, a distance of 40 miles, in five hours, changing mules but once.

We had been making good time, but for the next few days "time" was to be counted as nothing. At Navojoa I found that the heavy rains, unusual at this season of the year, had made the Yaqui country a veritable bog hole, and that a stock of good humor and patience would be needed to carry one through. I found at the Navojoa station an old gentleman—a correspondent for some United States newspapers—who proved to be very companionable.

While sitting on the porch that night a rough looking American stepped up to me and said:

"Brother, I am a miner and broke; can't you help me out." He looked very dissipated, and as I had heard the stage "boys" speaking of a Gringo who had been lying around drunk for several days, I remarked: "My man, I have heard of you, and if you are hungry I will give you a meal, but I can't give you money to carouse on." "I would like a meal very much," he said, whereupon my companion stepped into his room and getting a round cake of

cable ferry, which we reached at 4 P. M.

Just as we arrived, and before we could embark on the ferry, it started raining and poured for over an hour. After it cleared up we crossed and drove on to Forrin, the military headquarters of the Yaqui, reaching there at dusk.

Here we found that the water was backing up from the river into a meadow back of the town, threatening to cut off our progress the next day. We also found we would have to lay over a day or leave in a light, uncovered wagon. The young rancher and I decided to "move on," and made arrangements to go on the wagon. We were called at 3 A. M. and were ready to start by 4. As we were about to start I noticed that my baggage was not on and, upon enquiring why it was not loaded, was told it would have to await the next trip. In the next few minutes I did some very forceful and "persuasive" talking, with the result that my baggage was piled up behind our seat and lashed on.

It was still dark when we started, and a few minutes drive brought us to the back water. The driver



sent his "sota" (whip helper) to wade out and sound the way, and while he (the sota) was away, went himself to invest a quarter I had given him in a bottle of mescal—"oil," he called it.

Shortly the sota returned, reporting that he had gone as far as the fence and that there was no way of crossing, as the water was too deep.

The driver, having imbibed "spirit," jumped off the seat and went himself, returning in about twenty minutes and reporting that we could cross.

Our sota had not even gone into the water. We started, it still being dark, and as we reached the water two men seemed to rise out of the ground. One climbed on our load behind our seat and the other took the reins. The driver put a rope through the bit-rings of the leaders' bridles to lead them, and the sota walked alongside to yell and whip.

All went well for a hundred yards, when the water rose to the wagon box and the mules began to bog. For several minutes it looked as though we were going to stick, but yelling, lashing and good luck pulled us over the bad place and we pulled out, the mules all but swimming for fully 25 yards. When we got into the main road we found that our friends were driver's passengers, and they went with us to the outskirts of Potam, the next post and stage station. From Potam we traveled over the open, flat, coast country, over a fairly good road, as here it had not rained the day before, and reached Pitahaya, an isolated post, guarding that section from the Indian raids. Here we found a party of engineers who were at work, under escort, on the survey of a railroad line from Guaymas to and up the Yaqui river. Changing mules at Pitahaya, we struck off across the country for Guacimas, one of the largest military posts in the Yaqui country. The roads were extremely bad in places, and several times we stuck in the mud. Although scouting parties are continually catching Yaquis in this section, the road is well traveled and we continually met small outfits—traders who go from post to post. We met two carts, one drawn by three burros abreast and the other by a mule and a horse, stuck in the mud, and had to lend them a helping hand. The carts were loaded with oranges from Guaymas, and the two drivers were alone. Not 500 yards up the road and about 100 yards to one side, in the brush, we saw two Indians hanging to a small tree, left there four days before by a scouting party that had captured them in the nearby hills to the east. But "dead Indians are good Indians," so they say.

We reached Guacimas just at dusk but could find no place to stay for the night. Our wagon stopped on the roadside in front of the corral where the mules were kept. We succeeded in getting something to eat and then had to sit on the wagon or walk around until 10 P. M. waiting for a small saloon to close, so we could make our beds under the narrow porch. Luckily it did not rain.

The next day we started off at daylight, but had not gone far before our woes began.

We had but two stations to run to make the railroad and calculated to be able to make it by train time, 5 P. M. By 10 A. M. it became evident that the team we had—mules—would not make the first station, so, being near a ranch, we (the two passengers) bought some fodder and fed the mules, giving them nearly an hour's rest. We then hitched up and made a new start, but did not get far before we were stuck in the mud again; but we were not the only ones—there were others. We wallowed along until 1 P. M., when we found ourselves mired and the mules "played out." In this fix we appealed to a nearby rancher, who (it being the Federal mail) sent us two new mules, but, as we had to leave two of our dispirited animals that would not pull, we stayed where we were.

Seeing that further delay meant one more day lost, and perhaps two, I arranged with the mayordomo of the ranch for a two-wheel cart with two mules hitched abreast to take myself and belongings to the Batomotal station. After due delay the rig drove up and an Indian packed me over to a small island, 10 feet square, of dry ground—coming within an ace of falling flat with me enroute. Next my baggage came. The mayordomo was sitting cross-legged in the saddle, at the edge of the island, when my bed was "flopped" down by the Indian. At this his horse jumped, plunged into the mud and started into bucking. The rider managed to hold on for a few jumps, but he was taken at too great a disadvantage, and in one of the lunges, shot out sideways from the horse, measuring his length in the mud—face down. He was a ridiculous sight as he stood up, but he good naturedly joined in the general laugh at his own expense.

As I had but scant time to get to the railroad, counting on further accidents, (according to the Mexican saying, "Blessed are the evils that come singly,") I bade my companions goodbye and started off with an Indian youth for a driver.

We made good time and finally reached the railroad station, with an hour to spare.

The station was closed, and inquiry disclosed that the agent was at a dance given at a ranch, 5 miles away. As I was dirty and bespattered with mud, I repaired to a nearby hut and put on a clean shirt and stiff collar.

It looked for a while as if the train would arrive before the agent, but he finally came, just five min-

utes before train time, so I secured my ticket to Nogales and got my baggage checked just in time. After helping the agent to stow my baggage into the car, I boarded the Pullman and, after we got under way, put myself into the hands of the porter for a general cleaning. When he finished the change must have been great, for the porter remarked as he gave me the finishing touches: "You are quite presentable now, sir."

The next morning (4 A. M.) when we reached Nogales it was raining—had been for two days. The porter called me just as we arrived and I had to hurry, as we only had half an hour. As I was leaving the car the way was blocked by the bringing in of a man with a broken leg, which delayed me. I secured two men, got my baggage from the Mexican side, bought my ticket and opened up my baggage for inspection of the United States officials while the agent made out my checks. I paid no attention to the scolding the customs officials gave me for being behind, but strapped up, with the aid of my men, and managed to get on the train as it was moving out. We arrived at Benson without mishap or delay and got a good breakfast there.

We found that the Overland Limited was five hours late but would arrive in forty minutes, and that the other train was held the other side of a washout, somewhere east of Los Angeles.

Our train arriving, we boarded it, reaching El Paso, Texas, about 10 P. M.—in many places having made but 10 miles per hour, due to the soft condition of the track.

The next morning I crossed the river and sent some telegrams, returning to secure my tickets to Torreon and boarded the Mexican Central train in time. We were detained in Juarez about an hour passing the customs inspection. My baggage inspected again and checked, I returned to the Pullman and settled myself for a comfortable twenty-four hours, relaxing, with a sense of ease, the strain of alertness under which I had been for eight days. It was raining when we left El Paso and it kept it up almost to Chihuahua.

During the night we lost an hour and, as the International makes connection with the Central at Torreon on thirty minutes leeway, I missed the Durango train and had to remain over a day there—a day I spent to advantage, under the guidance of an esteemed friend.

The next day, March 17th, I took the Durango train, arriving at that city at 5 P. M. (ten and one-half days from the start), having lost four days on the trip. I completed arrangements that same night and the next morning at 7 started for the mines, 50 miles to the southeast of the city, in a coach, arriving there at 6 P. M. that same day. The next few days were spent in the usual routine work connected with the acquiring of data for a report on a mining property.

On the morning of March 20th the whole country was covered with about  $\frac{1}{2}$  inch of snow—and this in sunny Mexico at 24° north latitude, but the altitude was about 7000 feet above sea level.

Having secured my data and samples, I returned to the city of Durango and there wrote my report, turning it in on the 27th.

Durango is a city of about 40,000 inhabitants and situated on the western edge of the central Mexican plateau, and about 6000 feet above sea level. At present it is quite a lively place and the number of Americans at the hotels is noticeable. Here, in the Richelieu, is found one of the best hotels in all Mexico. The climate of Durango is delightful all the year round and extremely healthful.

On the 29th I took the morning train north to Tepehuanes, the present terminus of this branch of the International. The road runs as far as Chinacates, along valleys skirted by mountain ranges; but between Chinacates and Santiago Papasquero the route is scenic in the extreme, and is a credit to the engineer who located it. At Santiago it comes out into a narrow valley and follows up the river bottom to Tepehuanes, a distance of about 40 miles.

We arrived at Tepehuanes about 6 P. M. and were driven across the river into the town, where we found very good accommodations at a hotel run by an American. The weather for several days was simply perfection.

That same evening I arranged for mules and a "mozo" (servant and guide), to take me across the Sierras to Culiacan in the State of Sinaloa.

I laid in a goodly supply of provisions in the shape of bread, freshly dried beef, canned fruits, butter, cheese, etc., and the next morning at 8:30 left the town.

For an hour we traveled up the river valley to a little town called La Boca, leaving the river a short way above to climb the first range. As we started up the first slope my mozo stopped, took off his shoes, hid them in the bush and put on his "huaraches" (sandals), with the remark that he would not need the shoes until he returned, as the sandals were better. About 1 P. M. we rode down into a well watered valley, where we stopped to rest and feed. Late in the afternoon it clouded up, threatening rain, and at 5 P. M., arriving at a small ranch called "Chama-cueros," consisting of three log huts in a row, we decided to pass the night there.

(TO BE CONTINUED.)

## Cost of Mine Equipment.

Mining engineers are well aware that to sink a shaft, either vertical or inclined, to a greater depth than 2000 feet is an expensive undertaking, and the expense of equipment increases rapidly when depths greater than 2000 feet are attempted. In the Lake Superior copper region are the deepest vertical and also some of the deepest inclined shafts in the world. On the Rand in South Africa are many deep shafts and deeper ones are in contemplation or already under way. Some interesting figures have been given by a writer in the South African Mines on the cost of some of these deep-level shafts on the Rand. The writer says:

Few adequately realize the colossal expenditures mining companies have to bear before they can enter on the desire of their inception—that of profitable production on a basis commensurate with their scope and possibilities. To state the case roughly, it may be said that a Rand deep level—"1905 pattern"—costs a million sterling before a single ounce of gold can be obtained from it. We have taken four typical up-to-date companies which have entered the crushing arena during the last few months. Of these, one company is an outcrop concern, two are deep levels, and one is a deep-deep mine.

The principal items of expenditure incurred during the "nursery" stage are exhibited below:

	New Klein- fontein. 299 claims.	Robinson Cent. Deep. 456 claims.	Village Deep. 186 claims.	Wit Deep. 285 claims.
	200 Stamps.	100 stamps and Tube Mills.	180-300 Stamps.	200 Stamps.
Property .....	£256,816	£300,000	£ 287,694	£ 299,504
Shafts .....	78,207	63,689	142,963	77,061
Development .....	102,027	34,289	71,961	209,799
Machinery and plant .....	420,480	234,013	568,030	346,211
Buildings .....	57,679	55,428		101,544
Totals .....	£925,209	£687,419	£1,070,638	£1,034,119

It will be noted that in each instance the cost of property is between £250,000 and £300,000. With regard to shafts, the two deep-level hauling ways of the Village Deep make that company's expenditure under this head about double that of the Wit Deep, the property accounting for the next highest charges for shafts. Development costs at the Village Deep for large amount of ore exposed from one shaft are exceptionally small, while the Wit Deep seems to have spent a larger amount of money than one would expect on its ore reserves. The lavish expenditure incurred in present day equipments is ably evidenced in the Village Deep and New Kleinfontein. The plant of the former mine is probably surpassed by no other similar proposition in the world. The Robinson Central Deep has been brought to the producing stage at a much cheaper rate than the other companies dealt with, but its comparatively meager claim area and equipment should be considered in this respect. Taken in the aggregate the expense incurred for the development and equipment of the 715.6 claims mentioned above amounts to £3,717,385, or an average of £5194 per claim.

It must not be thought that the separate items given represent all the heads under which initial expenditure is necessary, or that the totals given are the aggregate sums involved in the operation of bringing the companies to the milling stage. There are numerous other expenses in the way of dues and sundry charges which have not been accounted for in the above. At the same time the table may be taken as a very fair indication of the pre-milling finances of typical mines.

It is interesting to compare the present day position with that existing in the early days. The smaller plants, lesser developments and diminutive ideas of the older outcrops seem ridiculously meager in comparison with the schemes and finances of to-day. For instance, we find in the balance sheet of the Wemmer, February 28, 1905, the following:

To claim account .....	£20,375
Machinery and plant .....	19,526
New battery account (less depreciation) .....	34,024
Cyanide plant (less depreciation) .....	6,850
Mine developments (less redemption) .....	23,800

And so on. Even the prevailing expenses may be regarded as small if we are to discount the vast sums of money that will be necessary for the latest mining conceptions of these fields.

In comparison with the above, some American installations (which cost as much or more than the most expensive of these) have been paid for from the proceeds of mining from the surface. Concerning this very heavy capital expense in the equipment of the deep-level mines of the Rand, an English engineer a short time since said it was considered a matter of small consequence, as the people who subscribed these large sums of money for equipment, development, etc., usually got tired long before the producing stage was reached and would get out of the enterprise at a loss, to try their fortunes in some other venture promising a more prompt return on the investment.

As a fair index of the prosperity of Tonopah, Nev., and of the confidence which its residents have in their district's future, it may be mentioned that 8,000,000 feet of lumber has recently been bought for the construction of new stores and residences.



## The Dry Blower.

Written for the MINING AND SCIENTIFIC PRESS.

In all arid countries where gold is found the dry blower can find employment for his talents. Whether his labors will receive a commensurate reward or not depends upon circumstances—which in this case generally means the richness of his ground. Regions where the dry blower has in the past found—and may again in the future find—profitable employment for the exercise of his ingenuity and labor are found in the great Southwest of the United States, in northern Mexico, in Western Australia, in some parts of Africa, and probably in many other localities. The prerequisites to successful dry blowing are a loose, light soil or gravel, uncemented and containing sufficient gold to make its handling by the slow and laborious—not to say wasteful—processes of dry blowing profitable. Usually dry blowing ground is found in the neighborhood of outcropping veins or zones of gold-bearing rock. Sometimes these outcrops are little, if any, above the desert sands containing the gold, which has been disintegrated from the veins. More dry blowing has been done in Kern county, California, with satisfactory results, than any other place in the Southwest. The district about Red Rock and Goler produced a large amount of gold, the greater part of which was obtained by dry washing and blowing. Machines have been used for years by Mexicans and Indians in the vicinity of the Colorado river, in both California and Arizona, with some success, but these latter diggings never produced the rich results found in Kern county. These led to the discovery of the rich quartz veins in and about Randsburg, though far less gold was

portion of the valley between two of these low ridges there may be a depth of several hundred feet of alluvial material. Often the disintegrated sand, rock and dust are found to be cemented a short distance below the surface, forming a sort of hardpan, and sometimes the hardpan contains nuggets of gold, while usually the stratum immediately above it is rich in coarse and fine gold. Generally the cementing material is lime. The prospector is usually of a curious turn of mind and tests the sands wherever his fancy leads him to do so, regardless of the surroundings, and in not a few instances his efforts have been rewarded by the discovery of payable gold in the wash, where no gold is seen in the rock outcrop. This is probably due to the occurrence of pockets of gold in the vein or in the seams adjacent to it in the country rock. Many pockets are found associated with veins where no gold occurs in the quartz itself.

In these desert regions a constant supply of water for washing by sluicing, or even by rocking, is not available, and as a consequence the prospector must resort to some other means to separate the gold from the alluvial material with which it is associated. This is why dry blowing in its various phases has been introduced in these regions. The simplest form of dry blowing is that practiced by the Indians, and consists in tossing the gold-bearing alluvial in a blanket during a strong wind. The lighter material is blown away, leaving only the coarse rock and gold. The former are picked out by hand and the fine concentrate left on the blanket is then carefully treated by blowing and hand picking until all the gold has been collected. This is also done by passing from one pan to another, as shown in one of the accompanying engravings. Another picture shows the dry blower searching his pan for gold after the winding operation has been completed.

As in many instances good pay resulted from this

one-tenth of the time that a skilled mechanic would require to perform the same amount of work without the aid of such device.

"Piping of steel, iron, brass, copper, or other material can be bent cold up to 2 inches diameter with one man. This device is of value in ship yards, pipe shops, locomotive works and other places where pipe is used to any extent.

"Manufacturers of heating plants, structural and architectural iron, fire escapes, etc., will find this portable pipe bender especially useful; it is also well adapted by having special dies, that can be readily attached, for bending light angles, flats or tee bars to any desired radius as easily as bending pipe. Where pipes are coated by the Sabin process, galvanized, tinned, etc., this machine will bend such pipe to any desired shape without breaking the coating in any way. One man can bend a piece of 2-inch pipe to an S bend in three minutes, no other assistance or device being used or needed."

The Chicago Pneumatic Tool Co., Chicago, Ill., are prepared to handle orders for this device and make prompt deliveries.

## Examination and Valuation of Mines.\*

NUMBER III.

**THE WORK OF SAMPLING.**—First survey the block of ground and plot it on paper to a large scale—say, 2 chains to the inch for areas between 50 and 100 acres, and 1 chain to the inch for areas under 50 acres. Divide the ground on the plan into blocks of 1 to 5 or 6 acres. The shape of the blocks will depend on the surface contours, the direction of the drainage and the probable direction of the gold leads. In some cases the ground is a long narrow strip



Fig. 1.—Concentration by Wind.



Fig. 2.—Looking for Nuggets and Flakes of Gold.

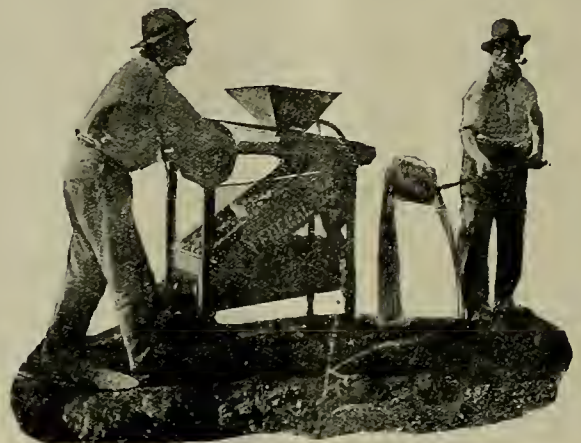


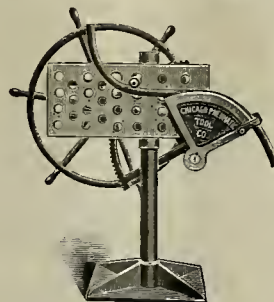
Fig. 3.—The Dry Blowing Machine at Work.

obtained by dry blowing machines at Randsburg than at Red Rock or Goler. In the Cargo Muchacho mountains, San Diego county, California, it is said thousands of dollars were picked up from the surface at a place called Pipindero, and the dry blowers found lucrative employment in working over the sand for finer gold. In many districts in northern Mexico dry blowing is still carried on in a small way, and in New Mexico are said to be good dry diggings, though the term good must necessarily enter a wide range of opinion as to what it may be. What the Indians may call good and be satisfied to work the white man would not waste time on longer than necessary to demonstrate its poverty of resources. In no country, perhaps, has dry blowing been carried on to such an extent as in Western Australia. In some of the gold districts of this section the gold lies on the surface or near it, much the same as it does in the southwestern United States. This occurrence of gold at the surface is due to the climatic conditions peculiar to desert regions. While dry diggings of value may be, and sometimes are, found in gulches in the desert mountains, it is a strange fact that most of the noted dry blowing districts in both America and Australia have been found in a comparatively level country—among low, rolling hills, where the ridges are usually capped by a quartz outcrop, which may or may not be gold-bearing, and the low valleys are filled with the coarse rock and sand, the result of the disintegration of the ridges. The rock masses suffer great and rapid decomposition near the surface, due to the wide range of temperature, and when rain—which is usually rare in these arid regions—does fall it comes almost as a deluge, washing away all the particles of rock which have been sufficiently disintegrated to be moved by the flood. The outcropping quartz veins and surrounding rocks often rise but little above the surface, and probably this is the reason why the discoveries have not been made sooner, as the prospector usually leaves the valley for the hills, where rock exposures are extensive. The desert wash encroaches upon the low rock outcrop, leaving more or less of the rocks exposed to view. As distance from the outcrop is gained the covering of detritus gets thicker, until in the central

very primitive method of working, the inventive faculty of the miner was exercised to find a mechanical device which would effect a separation of gold from sands, making it possible to handle large amounts of material at comparatively little cost. This necessity has resulted in the invention of dry blowing machines and concentrators by the score. Some of these devices are patented, others are not, but all work along the same lines, and their relative merit lies in the readiness with which each machine will screen out the coarse material and separate the gold from the lighter sands and pebbles. Capacity and power required are also important factors. That all the ground susceptible to profit yielding has been worked out, or even all discovered, is very improbable, for in the gold-bearing desert regions finds of auriferous alluvial are likely to be made at any time by the roving prospector. Southern Nevada, southern and western Arizona, southern California, northern Mexico, and the peninsula of Lower California, all offer opportunities in this line, and, as the saying is, "have not been half prospected."

## Pipe Bending Machine.

Herewith is illustrated the Chicago pipe bending



machine. The manufacturers state that an ordinary helper can, with the aid of this machine, bend an amount of pipe to any desired complex curvature in

situated on one or both sides of a river; in others terrace lands in a valley, which are in many cases intersected by lateral streams. Make a mark in the center of each block, and then number the blocks in consecutive order. Proceed to the ground and put a stake or flag in the center of each block. These stakes mark the sites of the sampling holes. The depth of gravel may vary from nothing to 40 feet, or more in very deep ground.

Where the ground is dry and not deep it is customary to sink holes or shafts at the selected points. The whole of the material excavated from the hole is carefully measured in a box of known capacity, washed by cradling, the gold contents weighed and the results recorded.

The record of each hole embraces information on the following points: (a.) Depth of ground. (b.) Character of bottom—that is, whether slate or false bottom. (c.) Character of gravel (note particularly if large boulders or drift timber exist in ground). (d.) Quantity of material excavated in cubic yards, plus 20% (all the boulders, both small and great, must be included in the measurement). (e.) Quantity of gold obtained. (f.) Quantity of gold per cubic yard.

In ground where the sinking of holes would be impeded to any considerable extent by water, it is usual to put down 5-inch or 6-inch boreholes at the selected points. The holes are lined with tubing, and the material extracted by the sand pump collected in a wooden trough, washed, and the gold contents weighed.

Record the depth of the hole, and calculate the cubic contents from the outside diameter of the pipe, plus 20%. The excess is added because experience has shown that the gold values calculated from the displacement of the pipe alone are always higher than the actual returns. This is, no doubt, largely due to the circumstance that a higher extraction or saving of the gold is effected in the sampling tests than in actual practice.

**WRONG METHODS OF SAMPLING.**—The method of selecting the test samples from open faces or from the sides or floor of small streams has often led to er-

\* Prof. Jas. Parks in N. Z. Mines Record.



roneous conclusions. In these places the gold is generally more or less concentrated, thus rendering it impossible for the examiner to form an approximate estimate of the average value of the gravels.

Pannings taken from the toe of gravel faces and from watercourses cut through the gravels are interesting, but inferences drawn from the gold obtained are usually very misleading. Furthermore, it must not be inferred that a placer claim which returns good wages to a small party of working mates will necessarily pay dividends to a company working on a large scale.

Working on a small scale the miners are always on the track of the gold. If the lead is lost the fact is known at once; but working on a large scale, where the shifting of quantity is an important factor in order to insure adequate returns for the capital invested, rich and poor gravels alike are moved, thereby reducing the general average.

**CALCULATING THE AVERAGE VALUE.**—The average value per cubic yard is found by multiplying the number of grains of gold per cubic yard found in each hole by the depth of the hole in feet, and dividing the sum of these products by the sum of the depths in feet, as follows:

NUMBER.	Depth of Hole in Feet.	Grains of Gold Per Cubic Yard.	Products.
1	14	3	42
2	15	4	60
3	18	2.5	45
4	15	3.5	56
5	13	3	39
6	14	5	70
7	12	2.5	30
8	10	9	90
9	9	6	48
10	14	4	56
Totals	134		536

The sum of the products is 536, and of the depths 134, therefore the average value is  $\frac{536}{134} = 4$  grains of gold per cubic yard. The average depth is  $\frac{134}{10} = 13.4$  feet.

The area of the ground and the mean depth being known, the total cubic content is easily determined; but ample allowances must be made for the possible inequalities of the bottom, etc.

Dredging for gold in river channels, river terraces, lagoons, etc., and the working of placer deposits by hydraulic sluicing and elevating are conducted on a large scale in California and New Zealand.

At the end of 1903 there were in the South Island of New Zealand 272 dredgers, of which over 200 were working, the balance being under repairs, or removed to other ground, standing idle, wrecked, etc.

At the end of the same year there were 2932 water races, having a total length of 6852 miles, and carrying 12,285 cubic feet of water per second; and 2346 tail races in connection with placer mining.

The experience of gold dredging and hydraulicking in New Zealand has proved conclusively that where the ground has been systematically worked by an experienced engineer practically no failures are known.

MINE SAMPLING AND ORE VALUATION.

In the majority of mines sampling proceeds simultaneously with the mine development, the results being recorded on assay plans, which are generally longitudinal or stope plans. Where the sampling during development has been carefully and systematically done, the averages should approximate those obtained by the mine examiner.

**SAMPLING EQUIPMENT.**—This includes new sample bags of canvas or stout calico, say 14 inches long and 9 inches wide; a canvas sheet, about 6 feet long and 5 feet wide; a short-handled 4-pound or 5-pound hammer; a gad or two; small linen tape or foot rule; and a number of small metal tags or strips of soft wood, each with a distinctive number or mark; and a stout canvas lock-up sack for the safe custody of samples.

**PRACTICAL SAMPLING.**—Begin the sampling of a level at the end of the main crosscut, or at some point easily located with respect to a survey peg on the mine plan.

When the whole width of the vein or seam is exposed in the drive it is customary to sample the higher or foot wall portion lying on the back of the level, as the lower portion may be partly under foot and often covered with mud and water.

Divide the level into sections of 5 feet, 10 feet or more, according to the extent of the open ground and character of ore. Mark the divisions with chalk, or by blackening the wall with a candle flame.

With respect to the sampling intervals, it is well to remember that a large number of small samples taken at short intervals are often more reliable than a small number of large samples taken at wide intervals.

When the ore is known to be consistent in value, and is exposed in long stretches, the sampling intervals may be 20 feet apart; but when the vein is somewhat irregular in width and value the 5-foot intervals will give the most confident results.

**RECORD OF SAMPLES.**—Carefully measure and record the width of the vein in feet and inches at each interval.

A simple and accurate method of recording the sampling intervals, widths and sample numbers is to draw a diagram in field book representing a longitudinal section of the level. On this diagram, which

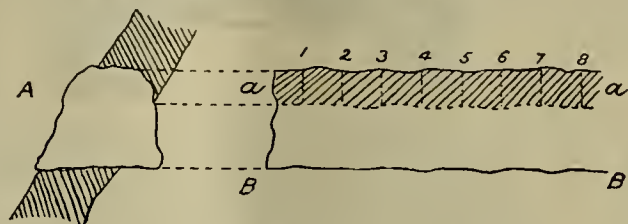
need not be drawn to scale, all the necessary information can be shown graphically. This method has also the further advantage that the assay values can afterwards be filled in at the different intervals, thus completing the record.

The widths, numbers and values are commonly recorded on mine assay plans in different colored inks, according to the individual fancy of the engineer; but this is not necessary in the examiner's field book, which is a private record.

**BREAKING THE SAMPLES.**—Dress the face down with a pick, so as to expose a fresh surface, and, if necessary, clean it with water.

With the hammer and gad break a sample at each interval, allowing the material to fall onto the canvas sheet, or into a stiff felt hat held by an assistant.

The sample is taken from a groove cut at right angles to the plane of the dip; or, in other words, across the thickness from wall to wall, as shown in



the figure, at the sampling intervals marked 1-8. In some cases it is necessary to square the vein on the back of a level or stope in order that the true width from wall to wall may be exposed for sampling.

In ore of fairly uniform hardness the width of the groove will vary from 4 inches to 6 inches, and from  $\frac{1}{4}$  inch to  $1\frac{1}{2}$  inch deep. The sample will generally weigh from two to ten pounds for every foot of vein or bed.

When the vein matter is arranged in distinct bands of crustification—this is with a comb structure—it is advisable to sample each band separately to determine where the values lie.

Wide lodes should also be sampled in widths of 2 or 3 feet, as sometimes the values are carried by the foot wall portion; sometimes by the hanging wall or central portion. In such cases a single sample taken from wall to wall may convey quite an erroneous impression as to the commercial value of the lode.

Where a level is driven on a wide lode, only a small portion of the ore is exposed for examination. In such cases it is customary for the management during the progress of development to crosscut the lode at intervals of 20 or 50 feet, according to the metaliferous character of the ore. These crosscuts will afford the examiner an opportunity of sampling the lode from wall to wall in such manner as the case may require. Where there are no crosscuts through the lode from the level, the full, or, at any rate, the payable, width of ore will generally be found exposed in the stopes.

It often happens, in the case of flat-lying veins, that the level has been driven on the foot wall of the

is rejected, and the assay sample broken down from the fresh surface exposed in the cut.

With uniformly soft material throughout, a pick may be safely used in breaking the samples; but with hard ores, or ores containing hard and soft patches, the hammer and gad must alone be used, as the pick is liable to find the soft places more frequently than the hard, with the result that a relatively larger proportion of the soft ore is broken than of the hard.

If the softer material is richer than the harder, as it often is, manifestly the sample will be unduly enriched; but if poorer, then the sample will be impoverished. In any case the assay value will not represent the true value of the ore.

**SAMPLING ON FLOOR OF LEVELS.**—In cases where the ore has been stoped out above a level it may be necessary to sample the vein along the floor. Here the rails, sleepers, water and sediment will increase the difficulties of the sampler. The blasting will have shattered the ore, and the interstices will have become filled with sediment either richer or poorer than the ore itself. In these circumstances the sampling must be conducted with much care and judgment.

**SAMPLING SPECIMEN VEINS.**—The valuation of gold-bearing veins in which the gold occurs in isolated bunches or patches at irregular intervals, or only at the intersection of cross veins or indicators, is impossible by the ordinary methods of sampling. Even bulk or battery tests are not

to be relied upon, as the values generally lie in a very small space. Thus, while hundreds of ounces of gold may be found in the space of a few yards, the ore for long stretches on both sides may contain no gold whatever. The valuation of such properties is a problem of almost impossible solution.

**SAMPLING OF STOPES.**—Stopes are merely a succession of horizontal drives. They are sampled in the same manner as levels. Samples are broken from the back, sides and working faces, according to circumstances.

When the width of the vein is less than the width of the stope, the vein and the rock must be sampled separately, the widths of each being carefully noted.

**SAMPLING OF WINZES.**—Ore exposed in rise and winzes is valued by breaking samples at 5 or 10-foot intervals from grooves cut at right angles to the plane of the dip. The thickness of the ore is measured and recorded on a diagram in the field book, together with the sample number at each interval.

(TO BE CONTINUED.)

A Characteristic California Mine.

The Gwin mine in Calaveras county, Cal., is a typical California mine in slate rocks. The mine was discovered in the early days of mining in Calaveras county, and under the original ownership it was worked to a depth of over 1200 feet. After an idleness of many years the mine was reopened by the



Gwin Mine, Calaveras County, Cal.

vein, or that the level has been timbered for the stoping. In these cases there is no exposure of the ore in the level, and the samples must be obtained from the stopes overhead.

When sampling a lode composed of very soft, friable or sugary ore it is advisable to expose a fresh surface by cutting a groove 6 or 8 inches wide and several inches deep. The material from this groove

present owners, the Gwin Mine Development Co., who have equipped and are operating the property in an up-to-date manner. The mine is at present over 2000 feet deep, and is the deepest mine in Calaveras county, and is operated through a vertical shaft. The accompanying engraving shows the surface works. The ore is treated by amalgamation and concentration.

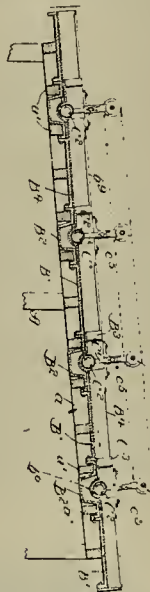


# Mining and Metallurgical Patents.

PATENTS ISSUED MAY 23, 1905.

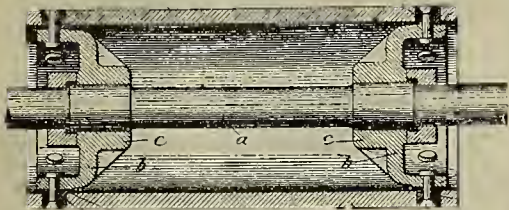
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

AMALGAMATOR.—No. 790,000; J. J. Peacock, Chicago, Ill.



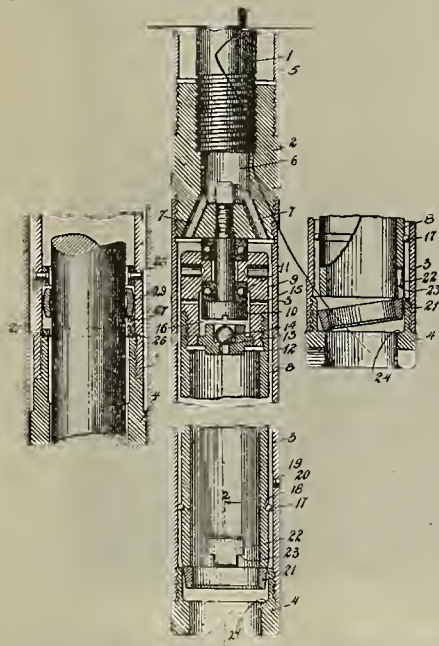
In machine of character set forth, combination with suitable sluice provided with well having imperforate end walls, of cylinder rotatably mounted in bearings inside end walls and dipping into well, cylinder being positively restrained by bearings against rising.

ROLLER FOR DREDGER LADDERS.—No. 790,210; S. L. G. Knox, Milwaukee, Wis.



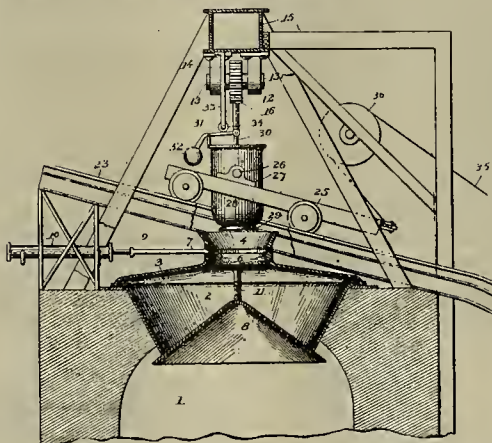
Built up roller for elevator dredgers and like, comprising shaft, disks mounted on shaft, hard metal shell carried by disks, plugs of softer metal cast in shell, and rivets passing through plugs and securing shell to disks.

CORE DRILL APPARATUS.—No. 790,331; C. A. Terry, New York, N. Y.



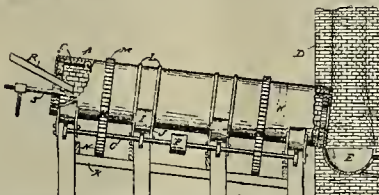
In core drilling apparatus, combination with drill rod, plug or coupler secured thereto, and outer core barrel rigidly secured to plug or coupler, of headed stud carried by plug or coupler, an inner sleeve rotatably supported upon headed stud, head or coupler provided with water chamber, and passage leading therefrom to between inner sleeve and outer core barrel.

CHARGING MECHANISM FOR BLAST FURNACES.—No. 790,271; D. Baker, Newton, Mass.



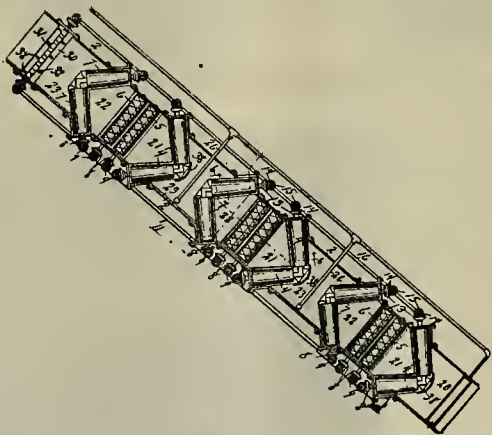
In combination with furnace, track leading to top of same, car traveling on track and adapted to receive materials to be charged into furnace, plurality of charging stations at lower end of track, source of supply for charging stations, and means for conveying materials from source of supply to stations and charging them directly into car.

SMELTING FURNACE.—No. 790,825; C. E. Glafke, Los Angeles, Cal.



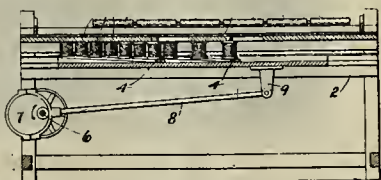
In smelting furnace inclined cylindrical smelting chamber having ends partially closed, closure extending from outer wall toward center and extending around entire circumference; baffle in chamber near lower end; means for feeding ore into upper end of chamber; means for feeding products of combustion into upper end of chamber; and means for rotating chamber.

AMALGAMATOR.—No. 790,445; T. J. A. Macdonald, Detroit, Mich.



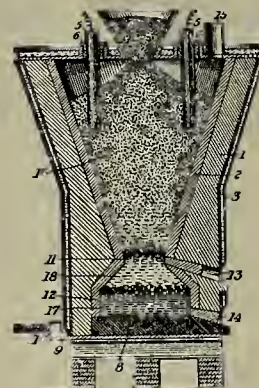
Amalgamator comprising inclined table over which ore pulp is adapted to flow, well in table containing amalgamating material, cylinders revolving in well and standing obliquely to line of travel of ore pulp and transversely arranged cylinders also revolving in well having channeled peripheries over which ore pulp is adapted to pass.

CONCENTRATOR.—No. 790,342; H. H. Campbell, Steelton, Pa.



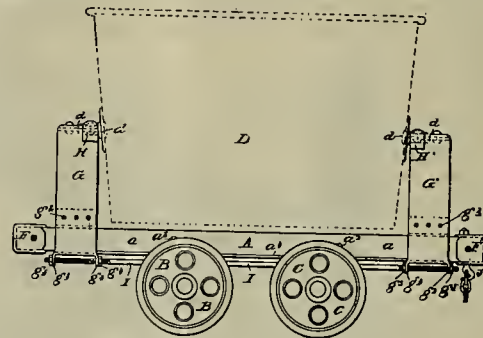
In ore separator, combination of table, series of magnets arranged adjacent thereto in row extending from near one corner of table to nearly diagonally opposite corner, means for reciprocating magnets transversely to table, and means for magnetizing and demagnetizing magnets at predetermined times, and means tending to carry material in direction transverse to that of magnet series.

PROCESS OF REDUCING METALLIC COMPOUNDS.—No. 790,389; E. F. Price, Niagara Falls, N. Y.



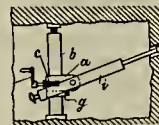
Process of recovering from ores, metals whose temperatures of reduction and volatilization are approximately same, which consists in heating charge of compound and reducing agent in electric furnace, keeping maximum temperature of charge at point which will substantially prevent volatilization of reduced metal, removing reduced metal from region of maximum temperature as it is reduced, and collecting scattered particles of reduced metal by introducing alloying metal into furnace and causing it to percolate downward through charge.

FRAME FOR MINE TRUCKS OR OTHER SIMILAR VEHICLES.—No. 790,759; G. Stott, Johannesburg, Transvaal.



In truck or like vehicle combination with frame comprising single centrally disposed member, member being adapted to carry standards or supports for pan and being of channel section, beam secured within member, horizontally disposed flanges on member and plates secured to flanges and carrying axle boxes.

ROCK DRILL MOUNT.—No. 790,506; M. Kuzel, Penzberg, Germany.



In drill mount, combination, with standard, bifurcated sleeve rotatable thereon, means for adjusting position of sleeve vertically on standard, worm wheel adjustable on standard by means of spline and groove and occupying position in bifurcated portion of sleeve, worm carried by sleeve and engaging with worm wheel, and crank for operating worm, of arm projecting from sleeve, and drill mounted on arm at point within horizontal plane embracing worm, and worm wheel, and passing through transverse axis of sleeve.

PROCESS OF SMELTING METALLIC COMPOUNDS.—No. 790,391; E. F. Price, Niagara Falls, N. Y.

Process of smelting metallic compound or compounds containing iron and chromium and producing ferro-chromium containing a definite percentage of carbon, which consists in providing electrically conductive charge containing predetermined amount of carbon, establishing electric arc within charge, surrounding zone of reduction and protecting electrodes from oxidizing and cooling effect of atmosphere by considerable body of charge and maintaining between electrodes minimum potential difference requisite to effect reduction, thereby preventing loss of electric current by leakage through charge and heat radiation.

PROCESS OF RECOVERING METALS AND OXIDES FROM SOLUTIONS.—No. 790,429; A. Gutensohn, Southend, England.

Process of recovering metals and oxides from solutions containing same, which consists in mixing solutions with alkaline solution, mixing product with solution containing alkali and resin, withdrawing coagulated mass, separating mixture therefrom and retorting same to distill off resin.



## The Semi-Precious Stones of the United States.

Written for the MINING AND SCIENTIFIC PRESS by  
E. A. REED, A. M.

Between the gems and the semi-precious stones it is difficult to draw the dividing line, as so many of them overlap into the other class. Those which may properly be considered only semi-precious often present such fine specimens that they are mounted and worn with good effect as jewels, while on the other hand the gems are sometimes offered in inferior grades.

Among the true rubies which are found in the Cowee valley, in North Carolina, there are also specimens of pink and red corundum which are enclosed in bright greenstone. The contrast is very pleasing, and the product is sold under the name of ruby matrix. The same combination is found in opal and turquoise; the emerald, also, being cut with its gangue, is offered as a jewel under the name of emerald matrix.

**AGATES.**—The agate is a variety of chalcedonic quartz which is distinguished by its banded or clouded appearance. The bands or layers are either parallel or concentric, and either in straight, circular or zig-zag forms. The natural colors of agates vary greatly, being either gray, red or brown. Some of them are classified under the head of onyx, or if the colors are red and white, they are called sardonyx. Many of them, however, are artificially colored.

An object of great scientific interest is the inscribed Chaldean agate ax now in the Morgan collection of the American Museum in New York. This ax was obtained by Cardinal Borgia while at the head of the propaganda. The Contessa Borgia offered it to the British Museum about twelve years ago for \$15,000 or \$20,000, but her extravagant price prevented its purchase by that institution. It was ultimately bought for about 15,000 lire and brought to America.

Small banded agates of much beauty abound on the shores of Lake Superior, while larger and finer specimens are plentiful in western Texas.

Much of this material is worked up into vases, paper weights, ash trays, etc. It is also mounted for use in jewel boxes, watch charms, scarf pins and other articles both useful and ornamental.

**MOSS AGATE OR MOCHA STONE.**—A chalcedony containing dendritic or moss-like markings. These intrusions of color are usually composed of one of the manganese oxides. In the Chinese moss agates they are often green, having been artificially colored.

Moss agates abound in many places in the United States, especially in Wyoming.

From 1896 to 1902, inclusive, the total value of agates in our country was officially reported at \$13,000.

**AGATIZED WOOD.**—Wood which has been changed to opal is called opalized wood, and some beautiful specimens are found near Clover creek, in Idaho; it is also common in Oregon and California.

Wood which is silicified by silica and still having the structure of the original material is called agatized wood. A marvelous amount of it is found in the petrified forest of Arizona, which is near Holbrook, and has been made more accessible by a railroad station at Adamana. From this point the ground can be reached by a drive of 6 miles, although the most remarkable portions of it are farther away.

At the first deposit there are several sections of land strewn with the fallen and broken trunks which have been washed out of the grayish sandy material in which they have been buried. Here is the noted chalcedony bridge, where one of the finest logs lies across a deep ravine, with the ends resting upon the banks and partially covered. This log is about 4 feet in diameter at its base and it forms a natural bridge nearly 50 feet in length.

The second deposit, lying a few miles to the southeast, covers several hundred acres and presents a difference of material.

In the first deposit much of the wood is broken and scattered over the ground; but here we have many large trunks which are only broken across, making cylindrical sections 5 or 6 feet in length. They are in a better state of preservation than those of the first, probably because they have been more recently washed out and have had shorter exposure to atmospheric action.

Silicified wood is also found in some abundance in the Rocky mountains and a forest in Yellowstone Park resembles that of Arizona.

This beautiful product is utilized by manufacture into vases, heads of canes and umbrella handles, while whole transverse sections are used as table tops.

During the seven years preceding 1903 the output of silicified and opalized wood in the United States was valued at \$31,000.

**TOURMALINE.**—This is one of the most beautiful of the semi-precious stones, many of the finer specimens being mounted and worthily worn as gems. In composition they are very complex borosilicates of aluminum, magnesium, iron or alkalies, falling under four types: The lithia group is often beautifully col-

ored and affords the best gem material; the iron, and the magnesia-iron groups are usually black or brownish black; and the magnesia group is commonly brown.

These general types are again subdivided according to color: The colorless tourmalines are called achroite; the black varieties are aphrizite and schorl; the blues, whether they are very pale or of a deep indigo shade, are classed under the head of indicolite; this also includes the brilliant blue known as Brazilian sapphire; the green tourmalines are called Brazilian emeralds; while the red ones, whether they are of a deep ruby or a pale pink, are known as rubellite. Even these are again subdivided into other classes. Having a hardness of 7 to 7.5 and a specific gravity of 2.94 to 3.3, they take a brilliant polish.

Tourmaline is usually found in granite, gneiss or mica slate. It occurs also in dolomite or granular limestone and in certain contact rocks near dikes of igneous rocks, also in rolled pebbles in alluvial deposits.

The physical properties of tourmaline are very interesting. It becomes highly electric under the influence of either heat or friction, and it has a remarkable polarizing action upon light, therefore plates which are cut from transparent crystals parallel to their length are used in optical experiments when mounted in the tourmaline pincers or tongs.

For 200 years Brazil has been one of the great sources of supply of the finer crystals. Ceylon, India and Burmah also produce some good gem material, the latter locality especially yielding some rubellites which rival the ruby itself in depth and brilliancy of coloring.

Rubellite and green tourmalines occur in Siberia. These stones are also found in great variety in the mining districts of the Ural mountains. One specimen from this locality is of great interest from the fact that, like alexandrite, its pure green color changes to a ruby red in artificial light, and this is only the second mineral showing this remarkable property. (Bull. Ural Soc. Nat. Sci., 1901, Ekaterinbourg, vol. 22, pp. 26-36).

There is a famous locality on the Island of Elba which yields pink, green, white, red, black or parti-colored crystals.

In Canada beautiful greenish-yellow crystals are found in the limestone of Great Calumet island; amber colored ones at Fitzroy, Ontario; transparent brown at Hunterstown, Quebec, and black in other localities.

In the United States one of the most famous localities is at Haddam Neck in Connecticut where green and parti-colored crystals are found which make beautiful gems. Mr. Ernest Sehernikow of New York, who was engaged in exploiting the albite quarry where they occur, made a representative collection of about eighty specimens and presented it to the Oxford Museum. This was very carefully investigated by Mr. H. L. Bowman who described it fully in the Mineralogical Magazine of London. His paper treats of ten species of which the collection contains examples, and mentions three others which are not there represented.

Maine is another State famous for fine colored tourmalines, many of which have been found at Auburn, Hebron, Standish, Andover, Norway and Paris. A great discovery of these stones was made at Mount Mica, near Paris, in 1820, and it is still yielding fine specimens of red, green and parti-colored tourmalines. Some of these crystals are over an inch in diameter and they may be red at one end and green at the other or they may be of a transparent ruby red inside and nearly or quite surrounded with a brilliant green. One blue crystal was found here which measured 9 inches in length.

Red and green tourmalines are found at Chesterfield, Massachusetts; the crystals are, however, small, curved, nearly opaque and often quite fragile; green crystals with distinct prisms of red on the inside are found in this locality. At Goshen, Massachusetts, similar varieties occur and the blue is met with in great perfection.

Fine black crystals occur at Pierrepont, N. Y., while good brown ones are found at Gouverneur in the same State, and also at Hamburg, N. J.

Southern California, however, now promises to be one of the best localities on account of recent discoveries there. Some of the stones from this region are half red and half green with a perfectly sharp demarcation between the two brilliant tints.

Several mines have recently been opened in Riverside and San Diego counties, and in the latter locality colored tourmalines have been found which are of remarkable size and beauty, although some of them have been broken in taking them out. Crystals are here found which are a foot long and 3 inches in diameter with a red central core (rubellite) and a blue exterior (indicolite), separated by a pale intervening zone.

So far as the official figures go, during the seven years preceding 1903 the output of tourmalines in the United States was valued at \$65,625.

**AMAZONSTONE.**—A beautiful green feldspar, a variety of microcline. Its color range includes several shades of green varying from the palest hue to a strong deep tint. So far the finest specimens have come from Pike's Peak, but inferior crystals are found in several localities. There is a cleavable

amazonstone which is found in goodly quantities at Amelia, Virginia, and being worked with comparative ease it may be used for a variety of decorative purposes. In the United States the value of the output varies from \$200 to \$1000 per year.

**CATLINITE OR PIPESTONE.**—This is a compact clay slate varying in color from ashen gray to deep red. It occurs principally in Pipestone county and other localities in Minnesota. But it is also found at Plandean and Sioux Falls, South Dakota; in Sac county, Iowa; Barron county, Wisconsin, and elsewhere, in the region of the upper Mississippi and Missouri river country. It appears to have been early utilized by the Sioux Indians who manufacture it into pipes. It is also used for paper weights, ash trays, etc. Although of comparatively small importance, it has nevertheless found a place in commerce, and during the seven years preceding 1903, the output was valued at \$15,000.

**BLOODSTONE OR HELIOTROPE.**—One of the varieties of quartz, which is really a translucent to opaque Jasper of a deep green color, interspersed with red spots. A discovery has been made of true bloodstone in Wasco county, Oregon, by Miss Nettie Hayes. Good specimens were here found which were of a deep rich green, with the red spots which characterize the true stone. Some of the pieces are as fine as those from India, but it may be some time before the locality is exploited sufficiently to make the output an article of commerce.

**CHRYSOPIRASE.**—A green, or bluish, or yellowish translucent chalcedony. An occurrence of chrysoprase is reported about 16 miles from Asheville, near Morgan Hill, North Carolina. The material is encountered in several parallel seams and within a few feet of each other. At the surface the color is pale green, but as the rock was opened down to about 4 feet the color became darker and richer. Beyond a little test work no development has been attempted and the value of the deposit cannot as yet be properly estimated.

It is found, however, in other localities, and during the seven years preceding 1903 the product of chrysoprase in the United States was valued at \$7400.

**CHLORASTROLITE.**—From chloros (green), aster (a star) and lithos (a stone)—literally a green star stone. It is a variety of prehnite, bluish-green in color, sometimes mottled and somewhat chatoyant on the rounded sides. It takes a high polish, and thus becomes very ornamental. It is found in the form of rounded pebbles on the shores of Isle Royale, Lake Superior, where it is obtained from the trap.

During the five years preceding 1903 the product from this point has been valued at \$18,000.

**SPODUMENE.**—A mineral occurring in monoclinic crystals of a prismatic habit and in cleavable masses. It is much like feldspar in appearance, but it has a higher specific gravity (3.13) and a more pearly luster. Its hardness is from 6.5 to 7.

Transparent spodumene affords gems varying in color from green of various shades to yellow or yellowish white; also, colorless or faint red to amethystine specimens may be found.

It occurs in Sweden, in the Tyrol and in Scotland. Most of the gem spodumene, however, comes from Brazil where it occurs in crystals closely resembling in color the chrysoberyl, which has not as yet been found to any commercial value in the United States.

Specimens of spodumene have been found at Windham, Me.; Winchester, N. H.; Goshen, Chesterfield and Norwich, Mass., and Brookfield, Conn.

Recently a very remarkable discovery of unaltered lilac-colored spodumene (kunzite) has been made in California. A mile and a half northeast of Pala, in San Diego county, at the notable deposit of colored tourmaline above noted, these crystals of spodumene were obtained at a depth of 50 feet. This locality is therefore unequaled in the world as a deposit of lithia minerals.

The spodumene crystals are beautiful in their color tones, varying from a deep pink-purple lilac in those taken from a great depth to a pale, almost colorless, tint which is apparently due to the action of sunlight. They are of extraordinary size, transparency and beauty and are unrivaled by those from any other known localities. Six of the California spodumene crystals vary in weight from 7.70 ounces troy to 17.1 ounces.

**HIDDENITE OR LITHIA EMERALD.**—A variety of spodumene varying in color from a yellowish to a deep emerald green tinged with yellow, the crystals often being yellow at one end and green at the other. The deeper colored kinds afford a gem resembling emerald but having a greater variety of color. Hiddenite is at present known from but one locality—Stony Point, in North Carolina—and nowhere in the United States has either variety as yet been found in any sufficient quantities to appear in the figures of the official reports.

**QUARTZ.**—Quartz crystallizes in the hexagonal system, the most common form being a six-sided prism. When pure it is colorless, and fine specimens are sometimes represented to be white topaz. They are also cut, mounted and sold under the name of Lake George diamonds, and other names. Other varieties are red, or brown, or yellow, green, or even blue or black.

On account of the great differences of color and



texture and its use as a semi-precious stone, many names are given to the various members of this large family, although they are chemically one substance. Of these, several have already been noted: Agate, agatized wood, amethyst, bloodstone, chrysoprase, etc. Besides these we may mention:

**CARNELIAN.**—A reddish variety of chalcedony passing into red, yellow and brown. It is translucent, takes a fine polish and is often of a clean bright tint. The natural colors are intensified by exposure to the sun's rays or to artificial heat.

**CAT'S EYE.**—Is a translucent quartz exhibiting opalescence or chatoyancy when cut cabochon. The term "cat's eye" is applied to a number of minerals which when cut in this way exhibit a peculiar opalescence characterized by a line, or ray of light across the stone resembling the contracted pupil of the eye of a cat. Such gems may be opaque, translucent or transparent, and may be of any color or colors.

**FLINT.**—A more or less impure chalcedonic quartz, usually gray, smoky brown and brownish black.

**HYALITE.**—Is clear glassy silica occurring in some lavas.

**JASPER.**—A massive quartz or chalcedonic rock, presenting little beauty until polished. Colors, dull red, green, brown, yellow and sometimes blue or black. When the colors appear in bands it is called ribband jasper; if zoned with colors it comes under the head of Egyptian jasper. This material takes a high polish and is extensively used for vases and other useful or ornamental articles.

**PRASE.**—Is a green, somewhat spotted, massive quartz.

**ROSE QUARTZ.**—Is usually massive. It is generally of a rose color, but may be of a pale pink. It is vitreous and sometimes opalescent. It is, however, liable to lose color by continued exposure to a strong light.

**VENUS HAIR.**—Is quartz penetrated with needle-like crystals of rutile and presenting the appearance of being covered with short threads or scattered hairs.

**SMOKY QUARTZ.**—Is of a smoky gray or yellowish color. The crystals are often pellucid, but occasionally the color is so deep as to render them nearly opaque with a brown appearance.

Since 1897 many pockets of smoky quartz, or cairngorm, have been found on the Littlefield farm, Auburn, Me. Several tons of crystals have been obtained, and one perfect specimen weighing twelve pounds was found near the farm of A. S. Berry in a deposit of large quartz crystals, feldspar and gem tourmalines. A perfect 3-inch ball was cut from a smoky quartz crystal found here.

**ROCK CRYSTAL.**—Transparent and colorless, this includes the pure crystals of quartz. Recently developed uses of this material are found in the manufacture of fibers for suspending small magnets and mirrors used as galvanometers, and in the manufacture of spectrum tubes, the quartz being fused by the oxyhydrogen blowpipe. Quartz fibers are used for galvanometers because they show no torsion, and the minors have no permanent deviation from the true position when at rest. Vessels made of fused quartz may be heated to a white heat and then plunged into cold water without injury, hence the value of these tubes in the study of gases at high temperature. Large quantities of rock crystal have been obtained in Calaveras county, Cal., near Mokelumne Hill, in a gravel mine.

**MILKY QUARTZ.**—A massive vitreous variety, having a milk-white color. It is sometimes opalescent and is used for many purposes. When finely crushed it is used by porcelain manufacturers for making glazes. Quartz sand and pure quartz finely ground are used for making glass. It is also used as an abrasive, either as sand paper or in fine powder. In these forms it is used for dressing stone and leather.

During the seven years preceding 1903 the three varieties of quartz crystal, smoky and rose, were produced in the United States to the value of \$89,950.

### A New Four-Valve Engine.

A new type of four-valve engine has been recently placed on the market by the Atlas Engine Works of Indianapolis, Indiana, in which especial attention has been given to the matter of steam economy, and a number of radical changes made with this in view.



Chief among these is the placing of the steam and exhaust valves directly in the cylinder heads, rather than at the top and bottom of the cylinder, which is designed to result in a reduction in the clearance, and to make the saving of steam effected in this way quite material.

The steam valves are operated directly from a movable eccentric forming a part of the automatic

shaft governor, and are thus independent of the exhaust valves. The latter are operated from a fixed eccentric on the main shaft, to insure uniformity of compression under all conditions of load and pressure. The connections are all made of the "straight line" type, and involve no multiplicity of parts. Both the steam and exhaust valves are double ported, and it is claimed that practically no wire drawing of steam whatever exists in this type of engine. Various tests made in the Atlas shops, as well as in the field, indicate a steam consumption virtually that of the Corliss type.

In addition to the line of medium speed engines, the builders are also offering a high speed, center crank engine for electrical service. This type has the reciprocating parts enclosed under an oiltight hood. At each revolution of the shaft the crank, crank pin, crosshead pin, crosshead guides and main bearings are showered with oil from a reservoir in the crank pit, into which the connecting rod dips. Oil from the same source is also delivered by centrifugal force to all other reciprocating parts, and is finally returned to the reservoir in the crank pit. This has proven to be an effective system of lubrication.

### The Cyanide Process.

NUMBER II.—CONCLUDED.

Written by R. STUART BROWNE.

The construction of zinc boxes is such that they may be used for either up or down flow by simply reversing the box end for end.

Punched sheet iron makes a better screen for the boxes than wire. The wire rusts more quickly and breaks down under the weight it has to support. The screen should always be a flat sheet without any vertical sides. A tray prevents the close packing of the zinc, for it leaves a space of about half an inch around the sides where the solution can come up and form channels.

Within recent years there has been a tendency to change from the old style of box and use what is known as the individual or single compartment type. These are boxes with a single compartment arranged for up flow, and are used in series, the number depending on the size. Some are connected together by suitable pipe fittings, while others are arranged to overflow into the lower box. Small tanks from 2 to 5 feet in diameter, and from 3 to 5 feet high, have been used for this purpose with a great deal of success. The cylindrical form is easier to pack and the tendency for the solution to channel is much reduced. They are more convenient to handle, less liable to leak, more portable, and much cheaper than the rectangular, multiple compartment box. It is quite likely that this form will entirely supersede the old boxes in the course of time. The number of boxes in a plant depends on the amount of solution handled and the way the gold precipitates. Separate boxes are used for handling the weak and strong solutions. The boxes should always be covered and a strong lock put on. Launderers are sometimes attached to the sides to facilitate the cleaning up. They are handy and reduce the mechanical losses in handling the slimes.

Below the precipitating boxes are the sumps. Two are generally used, one for weak and one for strong solution. In a very large plant there may be more. They are always placed at the lowest part of the mill. Sometimes where it is difficult to get sufficient grade the sumps are set into excavations made in the ground and the earth filled in around them. This should never be done. If it is necessary to set them underground, a space should be left around them so that they can be examined.

The solution tanks are always placed above the level of the top of the leaching tanks and are generally the highest tanks in the mill. Two tanks are used, weak and strong.

In a typical crushing mill there would be no solution tanks, but two extra sumps would be installed instead. A water tank should be provided. This should be elevated above the leaching tanks. Sometimes a small tank is used for dissolving the solid cyanide, but it is not necessary. The best way is to put the cyanide into a perforated box suspended under the pipe that delivers the solution. When the solution is pumped in the cyanide rapidly dissolves.

One of the most important features about a cyanide plant is the pipe system. This must be designed strictly in accordance with the treatment the ore is to be subjected to. The essential feature of a good system is simplicity. A complicated system, while it may possess certain good points, is apt to confuse the solution man and cause him to run to waste valuable solution.

All metal about the plant should be iron, as it will resist the corroding action of the solutions better than any other metal. Brass or copper should never be used, if it can be helped. The best valve for all-round use is the cheap cast iron plug valve. These valves are not as easy to manipulate as the more expensive gate valves, but they do the work and seem to have the preference.

The equipment and design of the clean-up room

needs careful attention. The mechanical losses from the handling of the gold slimes amount to a great deal, and though it is not possible to eliminate them altogether, they may be reduced to a nominal amount by taking the proper precautions. The clean-up room should adjoin the precipitating department, to avoid transporting the slimes any great distance. Both should have a concrete floor sloping to a drain pipe that discharges into a sump. In the United States the precipitate is usually refined by the acid process. The acid refining is conducted in a tank provided with a sheet-iron hood to carry off the gases. In large plants mechanical stirrers are used in the tank, but in small mills a wooden paddle will suffice. Lead tanks are the best for conducting the acid treatment in, but as they are very expensive and difficult to transport, redwood tanks are generally used in preference. They may be used without a protective coating, but it is best to paint them with P. & B. paint, after which acid will have no effect on them.

Below the acid tank there should be a settling tank large enough to contain all of the waste solutions from the refining operations. After a few days the top solution is decanted off and run through a filter to insure against any loss. To remove any excess of moisture from the gold slimes, either a filter press or vacuum filter pan is necessary. The former is to be preferred. Considerable hot water is necessary in the room for washing out the acid and salts from the precipitate. A convenient way of obtaining it is to have a cold-water tank with a steam pipe leading into it. By turning on the steam hot water can be obtained in a few minutes. A good way to dry the precipitate is by means of a steam coil arranged inside of a sheet-iron box with shelves to support the pans.

In designing the mill an important point to consider is the economical filling of the tanks with ore. If reservoir tailings are being treated the plant should be located below the supply. Then they can be shoveled into cars and dumped into the tanks from an overhead track. If the plant must be located above the reservoir, run the cars up the incline by means of a hoisting rope, and then run them to the tanks by hand. If the tailings have to be transported in wagons a bridge with a grating floor should be built over the tanks, so that the wagons can drive on to it and dump their loads directly into the leaching tanks. If the tailings are near at hand scrapers can be used instead of the wagons and the cost of shoveling done away with. Small plants can make use of scrapers to convey the tailings to the side of the tanks and then they can be shoveled in by hand.

In dry crushing mills the ore is always elevated into bins and drawn off into the tanks as desired. Some mills use shaking spouts to convey the ore from the bins, but the better way is to use ore cars running on a track built over the tanks. In handling dry crushed ore there is always a large amount of dust created, which represents a loss if it is allowed to get away. To prevent this, arrangements should be made for sprinkling the pulp at the earliest possible stage with either water or dilute cyanide solution. It should not contain any more moisture than is necessary to allay the dust. In wet crushing mills the handling of the pulp is complicated because of the necessity of removing the slimes previous to cyaniding.

**SLIME TREATMENT.**—The treatment of slime has always been the most serious problem connected with the cyanide process. It has been solved in a great many instances, but such successes have not resulted in the working out of a universal method of treatment, for the reason that slimes vary in their physical properties.

Slime treatment may be divided into three distinct operations, but it will be necessary to consider only the first two.

1. Dissolving the gold.
2. Separation of the solution from the slime.
3. Precipitation of the gold.

**DISSOLVING THE GOLD.**—This is always accomplished by agitating the slime in a cyanide solution. The question of the best form of agitation is an open one. Mechanical agitators of the paddle type are very good, but as they require considerable power to operate them, they are not much used. Centrifugal pumps are used a good deal and are satisfactory in every respect except that the cost of repairs is considerable. They are usually used in connection with conical bottom tanks arranged so that the slime can be drawn off from the bottom and thrown back on top. The use of compressed air for agitation is becoming quite common and gives excellent results. The time required to agitate an ore is variable and must be determined by experiment. If the time is short the agitation is continuous, but if long it is intermittent.

**SEPARATION OF THE SOLUTION FROM THE SLIME.**—This is the great problem of slime treatment. There are two standard methods in general use, known respectively as the decantation and the filter press methods. There are also certain patented processes which have much to recommend them, nevertheless have not been very widely adopted, probably because of the royalty question.

In the decantation method, after the gold has been dissolved the slime is allowed to settle for a certain



length of time and the clear solution on top is drawn off by means of a decantation pipe, siphon or pipes arranged around the sides of the tank at different heights. The sludge remaining behind usually contains from 50% to 80% of moisture. To recover the values retained in it, wash water or a weak cyanide solution containing low gold value is added and the sludge agitated to insure a thorough mixture, after which it is again allowed to settle and the clear solution again removed.

In general, two or three decantations will reduce the value of the sludge to a point where it does not pay to bother with it any further. The clear solution withdrawn is sent through the zinc boxes and the gold and silver recovered in the usual manner. The greatest objections to the decantation process are: First, it requires a very large amount of tank room, and, second, it causes the accumulation of large quantities of solution so low in gold value and so weak in cyanide that it becomes a serious problem to precipitate the gold from it.

Some varieties of slime will settle very quickly, while others require so much time that decantation is impracticable. Slacked lime has the peculiar property of coagulating slime and causing it to settle very rapidly. For this reason it is extensively used in slime treatment. The amount used varies from one to ten pounds per ton of dry slime. The proper quantity to add can be determined only by actual experiment.

Another method of separating slime and solution is that which is known as filter pressing. This was developed on the gold fields of Western Australia, where a process was required that needed a minimum amount of water. After the gold is dissolved the sludge is forced into a filter press under a heavy pressure. Clear solution flows out through the filter cloths and is conveyed to the precipitation department, while the sludge after washing is discharged and the press made ready for a new charge.

The filter press consists of a series of hollow frames from 1 to 3 inches thick, according to the nature of the slime, and from 2 to 4 feet square. Between each frame is a filtering surface covered with a cloth. When the press is together it consists of a series of from thirty to fifty independent chambers, each with a separate filtering surface. Arrangements are made for delivering the pulp to the center of each chamber and for washing the cakes after they have been formed. The greatest objections to filter pressing are, first, the high cost of the press, and, second, the cost of operation. Every time the press is filled it is necessary to open it for the purpose of discharging it. Nevertheless, filter pressing is the nearest and best way of treating slimes, provided, of course, that the slimes can be pressed. Some slime is of such a nature that it will pack in the press so that only very thin cakes can be made and the cost of treatment becomes too great.

Special presses have been designed for slime treatment. The largest ones have a capacity of several tons of dry slime per single charge. The time required to put a charge through a press varies from two to three hours, depending upon the porosity of the cakes. The greatest difficulty in filter pressing is to get a cake of uniform density. In charging a press the heavier particles tend to settle in the lower part of the chamber, and this makes that part of the cake the most porous. In washing a cake the wash water will follow along the lines of least resistance, and if the cake is not uniform the washing will be imperfect. For this reason it is necessary to adopt a very perfect system of classification where filter pressing is to be used.

The most rebellious slime is that which consists of the hydrated oxides. This material frequently baffles all attempts to treat it by the methods just described. It may be made amenable, however, by drying it at such a temperature that the water is completely expelled from it. When this is done it becomes very docile and may be worked by any method. For drying this class of ore the best form of furnace is the revolving cylinder of the White-Howell type.

In treating tailings that have accumulated in reservoirs it usually happens that considerable quantities of slime are found that have settled out from the sands. A good way of treating such slime is to plow and harrow it up and then mix it in with the sands in such quantities that it does not interfere too seriously with the percolation.

The fact that fine grinding gives an increased extraction has led to numerous investigations being made along this line, with the result that quite a number of mills have adopted fine grinding. In fine grinding mills the slime problem is not so serious as it would seem, provided that the ore is siliceous. The admixture of a large quantity of siliceous material with slime renders filter pressing a comparatively easy matter. The usual sequence of operations are fine grinding, agitation with a cyanide solution, filter pressing, precipitation of the gold, washing of the cakes and finally the discharging of the press. The success which has attended fine grinding indicates that before long its adoption will be widespread.

**THE CYANIDING OF COPPER-GOLD ORES.**—It is a well-known fact that cyanide has a great affinity for certain copper compounds, and the occurrence of an appreciable amount of them in an ore may make it

impracticable to treat the ore by the cyanide process. Sulphides which have not undergone oxidation are not appreciably attacked by cyanide, but the oxides and carbonates are very soluble.

There are two reasons why the presence of copper is objectionable—first, it causes a large loss of cyanide, which adds to the expense of treatment; second, it gives a great deal of trouble in precipitation. Gold and silver ores containing small quantities of copper are now being treated successfully by the cyanide process, and making a commercial success, but it requires very careful work, and much of it is of a delicate nature, requiring the services of expert chemists. Any lixiviation process which will treat coppery gold-silver ores and give a good extraction will solve one of the most troublesome metallurgical problems of the day.

It is known that ammonia will rapidly dissolve the oxides and carbonates of copper, and, second, that if an alkaline cyanide be added to the ammonia solution containing copper, a solution containing the double salt, cupro-ammonium cyanide will be formed, which will dissolve gold and silver. These reactions form the basis of several processes which aim to treat copper-gold-silver ores.

There is no question but that a high extraction can be obtained by the use of the proper reagents. The weak point is in the precipitation of the metals. D. Mosher, who has some patents covering the process, employs a boiling out method for recovering the ammonia and copper and then precipitates the precious metals from the cyanide solution on zinc shavings. He first leaches the ore with a weak ammonia solution to remove the greater portion of the copper. He then follows with ammonia-cyanide to dissolve the gold, silver and residuary copper, as in the ordinary cyanide process. The fact that the cyanide is destroyed by the copper does not decrease the extraction of the precious metals, for the cupro-ammonium cyanide that is formed has an equal if not greater affinity for them, probably due to its powerful oxidizing action.

The solutions coming from the leaching tanks pass through a continuous still built on the heat exchange principle. Here the ammonia is driven off and condensed in a receiver for further use. The copper is precipitated in the still as the black oxide. The outgoing solution contains the cyanide, together with the gold and silver. This is precipitated in the usual way and is made ready for the leaching tanks again by the addition of ammonia.

The important point in the process is, of course, the boiling out, and the question of expense deserves careful consideration. The patentee claims, and offers figures to prove it, that a still designed to handle 100 tons of solution per day can boil out the same at a cost varying from 15 to 30 cents per ton, depending on the nature and cost of the fuel employed. If this be true, and it seems quite possible, a new and important field is opened up for the cyanide process.

### The Influence of Fine Grinding.

In the discussion following a paper by A. W. Warwick in the Western Chemist and Metallurgist, P. Argall says:

The flint mill and the filter press have made fine grinding, as we now understand it, possible. Before the advent of the filter press in the metallurgy of gold ores, slimes were a bugbear and something to be avoided and yet if we had been called upon to produce 200 tons of slime per day, meaning by slime material that would pass 200-mesh screen or one four-hundredth of an inch-screen aperture, no two of us would have used the same methods to obtain these results; now, however, no one questions the superiority of the tube mill for fine grinding, and with this mill and the filter press it often becomes necessary and even desirable to grind ores to a very fine state of division in order to obtain high extractions or reduce the time of contact between the ores and the solvent. In South Africa the decantation process has been in use for many years in the treatment of the slimes separated from the stamped ores of the Rand, and lately this process has been brought up to a very high state of efficiency, but from the reports at hand it would seem that from the very best plants fully 10% of the gold is lost in a soluble condition; that is to say, it cannot be economically separated from the slime and is discharged with that material from the plants. It does seem rather hard, after getting the gold into solution, to lose so much of it; however, it simply points to the limitations of the decantation process, as there also limitations to the filterpressing of slime, and indeed each and every process has its shortcomings and limitations.

About a year since I was, while in Mexico, called to a tailing plant where both the filter press and the decantation process had failed in the treatment of very slimy tailings produced by arrastras, over a century ago, washed down the side of the hill and mixed with a rich reddish soil, leaves, etc.; a good crop of winter wheat was flourishing in the little valley which held this tailings mixture and it was impossible to distinguish between the soil and the tailings except by assay. A leaching plant had been erected but the material would not leach, then a Johnson filter press making 3-inch cakes 48 inches

square was put in, fully tested and condemned, and lastly a decantation process was installed with like result. I had never seen anything in the way of ore that could not be filter pressed and consequently I took that process first, using one part slime and one of solution; with material of this consistency a cake would ordinarily be made in ten to twenty minutes, but on opening the press after three hours' pumping I found there was but 1 inch deposited on the cloths, leaving a 1-inch space in the center. A second experiment, commencing with twenty pounds' pressure and gradually increasing to 120, did not make a solid cake in five hours, the experiment terminating with the bursting of the press and deluging myself and assistant with liquid mud. The filtration rate was only 300 c.c. per minute from 32 square feet of surface, so I decided the filter press was a first-class failure, so far as the treatment of those tailings was concerned. On investigating the decantation process I found the settling rate varied from 3 inches to 6 inches per day and that it was necessary to wait from ten to twenty days after agitating a tank before decantation could be proceeded with, and so this process, as ordinarily employed, was also a commercial impossibility.

Experimenting in the laboratory, I found that after roasting the slime and mixing it with cyanide solution it settled readily; in fact, after shaking, the solution became clear again in three minutes. Further experimenting showed that the addition of one pound of sulphuric acid per ton of tailings destroyed to some extent the colloidal substances present or at least wrought such a change in the slime as to cause a settling of 5 feet in twelve hours instead of 5 inches in twenty-four hours, which was about the best that could be done without the aid of the acid. I warned the chemist in charge to go as light on the acid as possible and six months after I visited the plant I wrote him for results. He reported he had several times cut down the acid slightly but that immediately the extraction of gold fell off. Here, then, we have a case where the addition of a cyanide not only helps the extraction of gold but also renders the decantation process possible, and, further, neither the filter presses nor ordinary decantation nor leaching could be successfully applied to this peculiar slime.

The difficulty in this case was not alone due to the very fine state of division of the ore, but to what I have described as gelatinous material and organic matter, but more correctly described by Mr. Warwick as colloid hydrates, a definition of slime I am prepared to accept as an accurate and precise definition of that substance that renders finely ground ore unleachable. I have experimented very largely on Cripple Creek ores and some years since had slimy ores crushed to pass a 200-mesh—one four-hundredth inch aperture—then floated off the material that failed to settle in the solution in five minutes, repeating the washing and floating, I believe, half a dozen times. I had left a gritty material that gave a leaching rate of 4 inches per hour, notwithstanding its extremely fine state of comminution. Bearing on this same point, the United States Department of Agriculture shows that wet grinding of rock increases the binding power or tendency of the particles to cement together. "This effect seems to be accompanied by direct decomposition of certain constituents of the rock magma, which results in forming colloidal films on the particles. The word 'pectoid' is suggested to describe this condition. Most rock powders that have been ground wet show an alkaline reaction to indicators, but if the water is filtered out the reaction is not easily shown. This observation is in line with the well-established fact that coagulated inorganic colloids have the power of occluding the bases from solutions of neutral salts."

The remark by Mr. Warwick regarding losing gold in slime by fine grinding, if I understand him correctly, requires modification, for as a usual thing the finer the ore is ground the higher will be the saving by amalgamation, other things being equal. Our South African friends are introducing tube mills to grind the ore finer so that the saving by amalgamation may be increased and the amount of the gold recovered by solution in cyanide decreased, though the combined extraction will of course be much higher.

We have seen that fine crushing for cyanide treatment has been rendered commercially possible by two inventions, both perfected in Westralia. I refer to the tube mill and the filter press. Should fine crushing become universal, as, indeed, it promises to, one naturally asks what is to become of the time-honored stamp mill? The stamp is not a fine crusher in the sense in which the term is used to-day, never was, and never will be. It attempts too much. Each machine has its economic limit, and the day of the one machine is passed and the tube mill has forever established the correctness of successive comminution, that I with others have so long advocated. I have shown that the efficiency of a rock breaker falls off rapidly, when a reduction exceeding four to one is attempted (say 8-inch to 2-inch cubes) and that for reduction below 2 inches rolls are far superior to rock breakers and that for rolls the same proportion of reduction holds good; and, furthermore, rolls reach their limit as fine crushers at  $\frac{1}{16}$ -inch screen aperture in dry crushing and for finer product their efficiency falls rapidly. What, then, is the efficient limit of the



stamp? No one knows. Some hold that a 1250-pound stamp will give as high a tonnage when fed with 2-inch rock cubes as if fed with  $\frac{3}{4}$ -inch cubes. I do not admit this in its entirety, but there is much truth in it, for the reason that in my opinion modern stamp practice has been for many years proceeding on a wrong basis—constantly increasing the weight of the stamp so that it can smash any size rock that can be passed into the mortar, and paying little if any attention to the preparation of the ore with rock breakers and rolls prior to sending it to the stamps. It is just possible that a 1250-pound stamp might sink through a  $\frac{3}{4}$ -inch ore bed and strike the die and so a well-prepared ore would under these conditions show even a lower stamp efficiency than if the stamp were fed with a maximum cube of 2 inches, as in the latter case there would be material on the die that would resist the weight of the falling stamp to the end that the greater part of the energy would be expended in the useful work of crushing the ore. Supposing, however, that  $\frac{3}{4}$ -inch cubes are fed to an 800-pound stamp and the output from the latter stamp was fully as great as the heavier one, as in most cases I know it would be, then the stamp advocates would be prepared to admit there was something wrong, and it only becomes necessary to reason out whether stamps or rolls are the most efficient machine for reducing ores from 2-inch to  $\frac{3}{4}$ -inch cubes, and to this there can be only one answer, as all must admit that the stamp is not a coarse crusher—we have previously seen that it is not a fine crusher, hence if it has an economic range comparable with modern machines it must be somewhere between the extremes given. A recent Rand experiment has shown that a 1250-pound stamp gave at 0.02-inch screen aperture a capacity of five tons per day; at 0.04-inch, 6.5 tons; at 0.05-inch, seven tons, and at 0.08-inch, ten tons per day, and the best all-round results were supposed to be made when crushing through an 0.08-inch aperture. Now if we assume the maximum size feed was 2-inch cubes, the range in reduction to  $\frac{3}{4}$ -inch is 100 to 1. Can any machine have an economic range over such wide limits? The efficiency of the stamp at  $\frac{3}{4}$ -inch is but one 140 pounds per horse power hour; rolls would give 300 pounds per horse power hour, while the roll output per horse power hour at 0.08-inch would also be vastly in excess of the stamp.

The stamp, then, if it survives in modern ore reduction plants, will only be one unit of a series of machines, its range of reduction being restricted to a very narrow limit. My idea of a modern fine crushing plant is, however, as follows: Rock breakers to 2-inch cubes; rolls in series, 2-inch to  $\frac{3}{4}$ -inch; grinding pans,  $\frac{3}{4}$ -inch to  $\frac{1}{4}$ -inch; tube mills to infinity, if required.

M. D. Stackpole in taking part in the discussion said, concerning the settling of slimes, that tables have been prepared giving the comparative value of different chemicals for settling slimes. My experience has been that the value of a settling agent depends upon the slimes under treatment. A recent slime, upon which I have been experimenting, settled with lime slowly and quite rapidly with sulphuric acid or salt. At the present time I am working on an almost pure kaolin, which to the eye appears impossible to handle commercially. When containing 30% moisture it cuts like cheese, and yet it is readily broken up in water and settles very rapidly without the employment of any settling agent. On another slime the employment of every conceivable means failed to induce settling, and the mixture of slime and liquor stood for days without settling at all.

While in Mexico last summer, working upon the substitution of cyanide for pan amalgamation then used, because of insufficient tankage considerable slimes were lost. Stored in the mill were large amounts of concentrates, too low in value to pay for shipment by mules 90 miles to the railroad. An effort was made to treat these concentrates by giving them a chloridizing roast and running them through the mill. A small amount of these roasted concentrates were fed each day with ore into the batteries, and, as long as this custom was followed, practically all of the slimes settled with the sands in the first two compartments of the settling tanks, and the water then ran away from the mill perfectly clear. In this same connection many of us have had to deal with thick layers of foam forming on the top of agitation tanks. This often forms from 1 to 2 feet in thickness, and of such consistency that you can cut a trench to the bottom of it and the sides will stand. Another engineer tells of having this foam 4 feet thick and such consistency that if a plank were laid across it, it would sustain its weight. This foam is caused by the addition of lime to a slime and increases with the lime added. A clear solution, no matter what the amount of lime, will not foam, but if a very small amount of slime be present with the lime, this foam will form.

As this foam is a very objectionable feature, a study of its nature and the causes that lead to it will be of interest.

Some eight years ago I was employed at a plant in which one of the first tube mills of modern type used for mining purposes was in operation. This mill was 20 feet long by 5 feet in diameter, and lined with chrome steel plates. We first filled this with cast iron balls of three sizes, but, because of the rapid wear and the large power required to drive this mill

a little less than one-half full of balls, some substitutes for these balls had to be obtained. The ore from one of the mines was a very hard, flinty, white quartz. We selected pieces of this from 4 to 8 inches in diameter, and filled the mill with them. For the first two days, until the pebbles were rounded, the results were about equal to those obtained from the iron balls, but, after that, they gave excellent results, and with the addition of 400 pounds of this material daily we were able to crush twenty tons of ore in ten hours, 90% of which would pass 100 mesh. I believe we could have obtained a much heavier capacity from this mill had we realized the necessity of a heavy feed, instead of allowing it to take the product from the rolls at the same rate at which it passed through them.

### How to Remember the Wire Table.\*

Written by C. F. SCOTT.

The wire table for the B. & S. gauge copper wire has a few simple relations, such that if a few constants are carried in the memory the whole table can be constructed mentally with approximate accuracy.

**RESISTANCE.**—A wire which is three sizes larger than another wire has twice the weight and half the resistance.

No. 10 wire has a resistance of 1 ohm per thousand feet; No. 7 wire, which is three sizes larger, has .5 of an ohm per thousand feet; No. 4 wire, which is three sizes larger than No. 7, has .25 of an ohm; No. 13 wire, which is three sizes smaller than No. 10, has 2 ohms; No. 16 wire, which is three sizes smaller than No. 13, has 4 ohms. It is easy, therefore, knowing the resistance of No. 10, to find the resistance of Nos. 7, 4, 1 and 000; also, of Nos. 13, 16, 19, etc.

A wire which is ten sizes larger than another wire has ten times the weight and one-tenth the resistance.

As the resistance of No. 10 is 1 ohm per thousand feet, the resistance of No. 0 is .1 of an ohm, and the resistance of No. 20 wire is 10 ohms. As the resistance of No. 4 is .25 of an ohm, the resistance of No. 14 is 2.5 ohms and of No. 24 25 ohms.

In the following table the first column contains the sizes of wire which differ from one another by three sizes. The resistance of each wire in this column is seen to be twice that of the next larger size and one-half that of the next smaller size. There is, therefore, no difficulty in remembering this column. In the second division of the table the wires are ten sizes smaller than those in the first division; thus, No. 11 corresponds to No. 1 and the resistance is ten times as great. In the third division of the table the wires are ten sizes larger than those in the first division; thus No. 0 corresponds with No. 10 and the resistance is one-tenth as great:

Size.	Ohms.	Size.	Ohms.	Size.	Ohms.
No. 1	.125	No. 11	1.25	No. 0000	.0001
No. 4	.25	No. 14	2.5	No. 0	.1
No. 7	.5	No. 17	5	No. 3	.3
No. 10	1	No. 20	10	No. 6	.6
No. 13	2	No. 23	20	No. 9	.9
No. 16	4	No. 26	40	No. 12	1.2
No. 19	8	No. 29	80	No. 15	1.5
No. 22	16	No. 32	160	No. 18	1.8
No. 25	32	No. 35	320	No. 21	2.1

From this table several new relations may be observed.

If the wire is one size smaller, the resistance is 25% greater. For example: Compare No. 11 with No. 10, No. 12 with No. 11, No. 13 with No. 12, etc.

If the wire is two sizes smaller, the resistance is 60% greater. For example: Compare No. 12 with No. 10, No. 16 with No. 14, No. 15 with No. 13.

If the wire is one size larger, the resistance is 80% that of the smaller wire. For example: Compare No. 9 with No. 10, No. 10 with No. 11.

If the wire is two sizes larger, the resistance is 63% of that of the smaller wire. For example: Compare No. 11 with No. 13, No. 4 with No. 6.

From the foregoing the following are the ratios of resistance between wires of consecutive sizes:

.50, .63, .80, 1.00, 1.25, 1.60, 2.00.

**WEIGHT.**—The weight of a wire is inversely proportional to its resistance. Therefore, the foregoing relations are the same for weight as for resistance, excepting that the weights increase as the size of the wire increases, instead of diminishing. The weights of successive sizes of wire, therefore, bear the following relation, beginning with the smaller wire:

.50, .63, .80, 1.00, 1.25, 1.60, 2.00.

If the weight of any size of wire is known, it is therefore seen that the weight of the next larger size is 25% greater; the weight of the second larger size is 60% and the weight of the third larger size is double; also, the weight of the sixth larger size will be four times as great, and the weight of the tenth larger size will be ten times as great.

The weight of 1000 feet of No. 10 copper wire is 31.4 pounds. Therefore, the weight of No. 7 wire is 62.8 pounds; the weight of No. 0 wire is 314 pounds. The weight of No. 5 wire is 100 pounds per thousand feet, which is a convenient figure to remember. The weight

of No. 2 wire is, therefore, 200 pounds, and the weight of No. 00 wire is 400 pounds.

**AREA.**—The area of No. 10 wire is approximately 10,000 circular mils (more precisely 10,380). The area is proportional to the weight. The area of No. 7 wire is, therefore, about 20,000 circular mils; of No. 0 wire, 100,000, and of No. 0000 wire 200,000. The precise area of No. 10 wire is 10,380 circular mils. Taking this figure for easy calculation as 10,400 and following the process above indicated, the area of No. 0000 wire is found to be 208,000, which is very nearly 211,600, the figure in the wire table.

**DIAMETER.**—The diameter of No. 10 wire is approximately 0.10 inch (more precisely 0.102 inch). The diameters follow the same ratio as the circular mils and weights, except that this ratio applies to alternate sizes. Therefore, the sixth smaller size has half the diameter and the twentieth smaller size has one-tenth the diameter. Therefore, as No. 10 is 0.10 inch, No. 16 is 0.05 inch and No. 30 is 0.01 inch; also, No. 4 is 0.20 inch and No. 000 is 0.40 inch; also, No. 0 (two sizes smaller than No. 000) has 80% less diameter, or 0.32 inch. No. 00, lying between these sizes, may be presumed to be about 10% less than No. 000, or .36 inch; the diameter given in the wire table is 0.3648.

Reference to a complete wire table will show that the figures in the above examples and other figures which may be determined in the same way are correct within a few per cent. A little practice in mental arithmetic will enable anyone to determine the approximate weight and resistance of wire of any size.

**SUMMARY.**—The things to be remembered regarding B. & S. gauge copper wire are the following:

A wire which is three sizes larger than another wire has half the resistance, twice the weight and twice the area. A wire which is ten sizes larger than another wire has one-tenth the resistance, ten times the weight and ten times the area.

No. 10 wire is 0.10 inch in diameter (more precisely 0.102); it has an area of 10,000 circular mils (more precisely 10,380); it has a resistance of 1 ohm per thousand feet at 20° Centigrade (68° Fahrenheit), and weighs 32 pounds (more precisely 31.4 pounds) per thousand feet.

The weight of 1000 feet of No. 5 wire is 100 pounds. The relative values of resistance (for decreasing sizes) and of weight and area (for increasing sizes) for consecutive sizes are:

.50, .63, .80, 1.00, 1.25, 1.60, 2.00.

The relative values of the diameters of alternate sizes of wire are:

.50, .63, .80, 1.00, 1.25, 1.60, 2.00.

**CIRCULAR MILS.**—Conductors of large size are usually specified in circular mils. For example, 500,000 circular mils, 750,000 circular mils.

As No. 10 wire has approximately 10,000 circular mils and a resistance of 1 ohm per thousand feet, and as the length of a wire which has a given resistance is proportional to its area, it follows therefore that the length in feet of a copper conductor having a resistance of 1 ohm may be found by dropping one cipher from the number expressing its circular mils—for example, No. 10 wire has 10,000 circular mils and a resistance of 1 ohm per 1000 feet; a 300,000 circular mil conductor has a resistance of 1 ohm per 30,000 feet and a 1,000,000 circular mil conductor has a resistance of 1 ohm per 100,000 feet. The weight of a given length is proportional to the area; therefore, the weight of a conductor having 500,000 circular mils is greater than that of No. 10 wire in the same ratio that its area is greater. Five hundred thousand circular mils is fifty times that of No. 10 wire, or approximately fifty times 32 pounds, which equals 1600 pounds per thousand feet. In this way the approximate characteristics of copper conductors may be quickly ascertained.

To find resistance, drop one cypher from the number of circular mils; the result is the number of feet per ohm.

To find weight, drop four cyphers from the number of circular mils and multiply by the weight of No. 10 wire.

## THE PROSPECTOR.

The rock samples from Bearmouth, Mont., are: No. 1, clay of apparently good quality; it should be sent to manufacturers of pottery, tiles, etc., to ascertain its value locally; fire clay is distinguished from brick clay, etc., by the almost complete absence of iron, lime and alkalis; if over 4% of impurities are present the clay loses its refractory properties. No. 2 is a fragment of rock crystal-quartz.

The rocks from Clarksville, Cal., marked E. W. S., are: No. 1 is diabase. No. 2 is probably syenite; the feldspars are much altered and are opaque, which makes optical determination difficult.

The red rock from Pearl, Idaho, is a consolidated volcanic tuff, the feldspathic constituents of which are altered to clay.

\*Trans. Elec. Club Jour.



## MINING SUMMARY.

Specialty Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The production of quicksilver in 1904 is estimated at 3391 tons, not including the output of Mexico and Russia, of which no statistics have been received as yet. In 1903 these countries yielded 190 and 362 tons, respectively. The production in 1904 of the United States, Spain, Austria, and Italy were 1480 tons, 1020 tons, 536 tons, and 355 tons, respectively. Counting the output of Mexico and Russia, the world's production for 1904 will probably amount to 4000 tons.

### ALASKA.

The Canada Klondike Co. is putting in a bucket dredger 40 miles above Dawson.

T. S. Nowell has sold to B. Thane and associates claims owned by the Nowells, the Borsors Bay M. & M. Co. and the Northern Belle G. M. Co., including the Eureka, Johnson and other mines near Juneau. The 40-stamp mill on the Eureka property is to be equipped with concentrators. A body of rich ore has just been struck in the shaft of the Jualin mine, Berners bay, at the 160-foot level.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The Calumet and Cochise group, or the Cunningham group, near Bisbee, has been sold to the Warron Realty & Development Co., one of the Bonanza Circle enterprises. Bisbee, May 29.

The Promontory mining claims at Bisbee have been sold to Eastern capitalists for \$60,000. The new owners will develop them and make surface improvements.

The drift on the 500-foot level of the Shattuck mine at Bisbee is in 140 feet. The shaft is down 665 feet. Two gold bars valued at \$700 are the product of six days' operation of the 5-stamp mill of the Gold Nugget M. Co., 4 miles southeast of Bisbee. New stamps are to be added to the mine and concentrators put in. Two new hoists are also to be added.

#### Gila County.

The Con. M. & Dev. Co. is preparing to begin work on their property, 9 miles west of Globe, at the head of Arkansas gulch. R. Fleming is having a shaft sunk on a claim adjoining the Geneva mine, owned by the Old Dominion Co. of Globe. The shaft is down 70 feet.

#### Graham County.

The Arizona Copper Co. has started work on a tunnel through International hill to connect the Humboldt mine at Morenci with the proposed site for the new concentrator which will be built on the old Detroit mine opposite the smelting plant of the Detroit Copper M. Co. The new concentrator will be capable of handling 700 tons daily and will be connected with the Humboldt mine by electric motors, which will convey the ore to the mill. The tailings will be delivered into a series of settling tanks and dried, after which they will be hauled to the mines and dumped into the waste pits, thus overcoming the additional damage to the rivers below. The construction of the plant will be under the supervision of C. D. Clark.

The Arizona Copper Co. at Clifton have three Hancock jigs in operation and are preparing to put in two more. One of the jigs is said to be handling 800 tons of ore daily. The jigs have increased the capacity of the plant 300 tons daily. Geo. Fraser, superintendent of the smelting department of the A. C. Co., has commenced a new tailings bin on the bank of the river where the old bins stood before the flood. The bins will have a solid rock foundation.

#### Mohave County.

L. Hoffman, superintendent and one of the owners of the Samoa mine in the Central range, 5 miles east of Chloride, has increased the working force of his mine and will begin operations on the Fourth of March claim adjoining on the east. The Yucca M. Co., in San Francisco district, are down 516 feet in their working shaft, in 3 feet of ore on which the mill is being run. The directors have agreed to put in new and better machinery in both mine and mill and the development of the property below the 500-foot level. Air drills will be put in and an up-to-date plant put in the mill.

E. B. Payne has opened up silver ore on his Roger Boy mine, 5 miles northeast of Chloride.

#### Pinal County.

Sinking has been resumed at the Buckeye shaft of the Troy-Manhattan Co. at Troy. The shaft is to be carried from the present 200 to the 500-foot level.

A successful run of ore is said to have been made through the Monarch 10-stamp mill, belonging to the Desert Queen G. M. Co. in Casa Grande district. The vein is a fissure in limestone and is opened up by a 60-foot shaft. The company is planning to put in a 40-ton cyanide plant for a recovery of the fine gold in the mill tailings.

#### Yavapai County.

(Special Correspondence).—At the Sterling mine in Big Bug district, pumps are clearing the mine from water and development work will soon be taken up. The main shaft is down 470 feet and drifts are being run both ways on ore.

Big Bug, May 30.

A rich strike has been made in the properties belonging to the Oro Con. Co., on the west side of Kirkland valley. The ore was broken while sinking in the 180-foot shaft. The shaft will be sunk to a depth of 300 feet and cross-cutting started.

A dam is to be built in the canyon below the Rincon mine, near Prescott, to store water for milling purposes. The dam will be 180 feet long, 22 feet wide at the base and 4 feet wide at the top. The capacity will be 400,000 gallons. The Pittsburg-Jerome Copper Co., 3 miles southwest of the United Verde at Jerome, is making

preparations to put in a reduction plant. C. E. Butler, manager for the company who purchased the Czarnowski Do Amond and Patterson claims, near Martinez, is making preparations for work at the mine.

### CALIFORNIA.

#### Amador County.

The Bay State mine, near Plymouth, is closed down at present. W. W. Worthing is superintendent. P. B. Aikon, interested in the Climax mine, near Pine Grove, reports that the 5-stamp mill has been disposed of and a 20-stamp mill will be put in. The Burlington mine, near Sutter Creek, is putting in machinery from the Stuckton Hill mine, in Calaveras county.

#### Butte County.

It is reported that the rock piles turned up by the dredgers near Oroville will again be turned over in the search for gold. Gold is believed to exist in paying quantities below hardpan, and it is said that before many months drills will be at work prospecting to a much greater depth than the present dredgers are working.

#### Calaveras County.

At the South Bank, on Indian creek, the excavation for the mill is nearly completed. The shaft is to be sunk another 100 feet.

The North Star M. Co., near Mokelumne Hill, intends doing extensive work soon. J. C. Kemp Van Ee, the manager, intends putting in electric machinery to operate the works. The drain tunnel, which is 2100 feet in length, 10 feet wide at the bottom, 8 feet on top and 7 feet high, with a double track, will be equipped with electric motors, and each motor will pull a train of six cars, holding two tons each. The rails are thirty-five pounds in weight. The gravel will be worked by a cylinder mill and 800 tons per twenty-four hours will be handled.

#### El Dorado County.

The Miners' Association of El Dorado county, A. B. Gould of Placerville president, has appointed a committee of reference to whom all inquiries concerning the mines of El Dorado county can be referred. This is hoped to expose certain wildcat schemes recently advertised. At the Rio Vista copper mine, near Fairplay, they are down 400 feet and 140 feet below the bed of the river, where they are drifting. A new dam and flume will be built to insure a fall of 250 feet.

#### Kern County.

It is reported that the Yellow Aster Company at Randsburg is to put in 170 more stamps, making 300 in all.

#### Nevada County.

The Wright and Bailey claims, on the Middle Yuba, near Sweetland, have been sold to a New York company by O. Phippen of Forest City, H. Daniels of Nevada City and Mrs. Cross of North San Juan. The ledge is said to be 125 feet wide and can be easily worked from near the river. The company intends to quarry it out from wall to wall, starting on the river and working up. It is understood that the mill will have a capacity of 500 tons daily. In addition, a cyanide plant will be built. The machinery will be operated by electric power.

#### San Diego County.

(Special Correspondence).—In Pine Valley district, about 10 miles east of Descanso P. O., the Noble mines have been operated for several years. The veins occur in mica schist and in places are high grade in gold values. Lead ores rich in gold also are found here. A recent development is that of a vein in gneiss. The vein is about 2 feet wide and it carries shoots or lenses of mispickel which is auriferous. In places the vein is 8 to 10 feet wide and outcrops for several hundred feet. It is accompanied by a dike rock. This is the first development of any considerable quantity of mispickel in these mines. This particular vein is about 200 feet distant from the contact of granite and schist. A promising copper prospect has also been discovered recently on the divide between Pine valley and Cottonwood creek, the iron gossan of which is reported to assay 10% copper and \$4 gold per ton.

Descanso, May 28.

#### Shasta County.

The tramway at the Sunny Hill mine at Igo is completed.

The aerial tramway that will transport ore from the Mammoth mine to the smelter at Kennett will be 12,835 feet long. The mine is 2205 feet higher than the smelter. On the tram line there will be thirty-eight towers for the support of the cable-line. The highest of these will be 95 feet. There will be two tension stations and one transfer station. In the Mammoth mine 120 miners are employed blocking out ore.

#### Sierra County.

Extra men are employed on the Sierra Buttes mine at Sierra City, grading and getting ready to put forty stamps in the old No. 9 mill, also an addition to the cyanide plant which has been running successfully since last fall. The Mountain mine, above Sierra City, has started with a small force repairing the tramway which was buried last fall. More men will be put on as soon as the roads are in condition to haul lumber from Sierra valley. At the Keystone mine, near Sierra City, they are raising on the vein from the lower tunnel to tap the upper works. The raise is up 360 feet with 80 feet more to go. Repair work is being done in the tunnels in the upper workings. At the Marguerite mine, near Sierra City, they are pumping out the old shaft. The new company has put in two new pumps. The same company is also operating the Northern Belle. R. Phelan has men building a bridge across the Yuba river at the Big Avalanche ravine. He also has men grading for a 5-stamp mill on the Roman mine, and several working on the Commodore, near Sierra City. At the Pride mine, above Sierra City, they are running a prospect drift to determine the value of the large gravel channel, as it is thought by the owners that the mine will pay better for drifting than by hydraulic mining and at less expense. Hayden & Kish are making preparations to start the Gold Ridge, near Sierra City. There is some talk of starting the Butte Saddle and Chipps mines this season. Berger & Winters have bonded the Young

America mine, near Sierra City, and will begin operations immediately.

C. S. Weisenborger will put up the 5-stamp mill on the Two Counties mine, south of Alleghany. J. M. Harper, superintendent of the Diadem quartz mine and the Columbia Channel gravel mine, at Forest City, has men repairing the Diadem drain tunnel and will pump out the 250-foot shaft and reopen the property.

#### Siskiyou County.

J. R. Wade, of the dredger at Callahan, reports that he will close down for a week, to add more buckets to the ladder in order to reach the bedrock. A rich strike is reported from the Wild Irishman claims, near Cecilville, owned by H. Bowerman. At the McKean mine, near Callahan, forty men are at work. The cyanide plant is kept running constantly. The Siskiyou Electric Light & Power Co. is preparing to put in new machinery at Fall Creek, and to increase the plant 1500 H. P. The Scott River Advance says that the King Solomon mine, near Cecilville, will resume work before the year is over. As soon as a wagon road is finished, the company will put in machinery that will enable them to handle 100 tons of ore daily. They expect to put in an electric power plant in the Salmon river for generating the power. A new sawmill will be built and, after the lumber is sawed, they will put up a milling plant, boarding house and bunk house. A lower tunnel is to be run. The Salmon River Co. of Cecilville are extending their flumes from the Summerville property down to the Petersburg placer mines on South Fork. They are sawing lumber and expect to commence their buildings soon and be ready to mine by October. Henderson, Heighy & Marcus have a lease from the Salmon River Co. and are mining the gravel near the Jordan place on South Fork. They have two 6-inch giants and plenty of water operating night and day on a good bank of gravel. S. Conzetti is operating his giants on the Canyon claim, near Cecilville. Smithson & Roberts, of the Knownothing mine at Gilt, are running in their lower tunnel to tap the vein. Superintendent Taggart, of the Red Hill M. Co., has men working at the Red Hill placer claim on South Fork, also at the sawmill to get out lumber for a new flume to be built from Knownothing creek on to the Missouri Bar claim, above the Forks of Salmon. A. Ball expects to resume work on Methodist creek, near Gilt, by June 1. Godfrey Bros. will start their quartz mill, near Gilt. The Gold Run M. Co. of Gilt are doing development work in their upper tunnel.

The Jenny Lind mines, in the Humbug mining district, near Yreka, has been sold by O. Lamson and J. F. Van Saun to M. B. Newcomb of Oat Hill, Napa county.

#### Tehama County.

(Special Correspondence).—C. M. Basler of the Basler M. & D. Co. reports a good ore body at their property at Lowry P. O.

#### Trinity County.

D. C. Dedrich of Junction City and W. E. Livesley of Reno, Nev., have bonded the Lookout quartz mine, near Indian Creek, from M. Collins. Dedrich has charge of work at the mine. J. H. Porter, manager of the Fairview mine at Papoose, reports that the company is running thirty of the forty stamps in the mill. Work will be begun on the Oriole mine on Indian creek, owned by Paulsen & Collins Bros.

#### Tuolumne County.

(Special Correspondence).—The Sierra Railroad has engineers in the field running a preliminary survey to extend their line to Sugar Pine and the Jawbone country. This will open up to prospectors a desirable field. It is proposed to reopen the old Dead Horse mine, on Turnback creek, at Carters. It is proposed to drive a diamond drill hole from the tunnel into the old workings and drain off the water through it. Superintendent N. Carmichael of the Confidence mine, 4 miles northeast of Soulsbyville, states that if that mine was sold it would close down until new machinery could be put in. If not, it would probably be run as at present until fall, and then the machinery would be pulled and the mine closed indefinitely.

Carters, May 31.

The Rawhide mine, at Jamestown, has been closed down while the shaft is being repaired and retimbered. Water has caused the shaft to cave, and it is said the pumps are unable to keep the mine clear. Skips have been used for bailing, yet it is reported that the 1600-foot shaft is filled with water to the 1000-foot level.

It is reported that work is to be resumed at the Republic mine, near Sonora. The copper property on Mitchell ranch, near Cooperstown, has been unwatered and sampled. J. A. E. H. and H. McMahon have bonded to I. Le Mahieu, one-half interest in the Fair Oaks mine, in Confidence district, between the Mustang and Butter Cup mining claims, in consideration of which he agrees to build and equip a 5-stamp mill, complete with amalgamators, ore bins, concentrators, etc., said mill to be used to crush rock from the Mustang and Fair Oaks mines. At the Eagle-Shawmut mine near Chinese Camp nearly 250 men are employed and the 100 stamps are dropping steadily. The chlorination plant across the creek keeps the aerial tramway in operation transporting the concentrates from the mill. It is reported that for the last month the total expense per ton for extracting and reducing ores was \$1.46. C. E. Uren is manager. The shaft of the Republican mine at Jacksonville is down 650 feet and ore for the 20-stamp mill is being taken from the 200 and 300-foot levels. T. H. McGovern is superintendent. Manager W. J. McCray has put in an 8-drill compressor at the Clie mine at Jacksonville and will start sinking in the shaft. The 10-stamp mill will not be started for a time. G. Chamberlain is superintendent.

### COLORADO.

#### Boulder County.

(Special Correspondence).—The Strong-Trojan M. & L. Co. has been organized and will start operating the old Trojan on Sugar Loaf mountain. Salina, May 29.

(Special Correspondence).—The Chicago, Bird's Nest and Enterprise mines have started hauling ore from the



mines to the railroad for shipment. The roads have been in such shape up till the present time that they have been unable to get the ore down from the mines. The Colorado & Northwestern is operating its trains into Eldora and Ward. It is understood they are extending the third rail from Boulder into Denver over the Colorado & Southern, and will be operating their trains out of Denver. The Colorado & Northwestern is narrow gauge and in order to enter Denver they are obliged to lay a third rail.

Eldora, May 29.

(Special Correspondence).—The Governor Routt mine, W. C. Austin manager, is operating at the 117-foot level and taking out ore averaging from \$30 to \$35 per ton. The shaft is down 160 feet.

Sunset, May 28.

(Special Correspondence).—North of Ward, on Little Jim creek, the Myrtle M. Co. is overhauling the 50-ton mill. When in operation the ore will pass through the rock breaker, then to the roughing rolls and over a rotary screen, which takes out all the ore to 20 mesh, the oversize going through the finishing rolls into the bin and through the Motter roaster, from the roaster into the storage bin, and from there to the cyanide tanks. It is expected that the mill will be in operation by June 1. A. T. Rautenberg is manager and R. C. Morrison mill superintendent. The shaft on the Myrtle is down 340 feet; also a tunnel 900 feet in intersects the shaft. The ore from the tunnel level is said to average \$8 per ton. The Utica Hill G. M. Co. are overhauling the Quiglyville mill and will operate the same on ore from their own mine. They have put in ten stamps and plates; also have two Wilfley tables and two vanners. They have 200 tons in the bins awaiting treatment. The mine is 2 miles from the mill. J. J. McKinry is president and manager. The smelting ore averages \$70 to \$120, mill dirt \$15 to \$20 per ton. The Ward Strugler G. M. Co., 3 miles north of Ward, is doing development work in the mine and putting the mill in shape for operation. The ore after being hoisted to the surface is trammed to the mill, where it is handled automatically. The mill when operating will have a capacity of forty to fifty tons per twenty-four hours. When running full capacity they will employ thirty-five men in the mine and mill and have a daily output from the mine of sixty tons. G. M. Mitchell is manager. The mill is on the south fork of the St. Vrain river. The B. & M. mine is under lease to G. A. Kline & Co., who are operating at the third and fourth levels and shipping three to four cars of ore per month. They expect to put machine drills at work shortly and do some prospecting and development work on the 500-foot level. Ed. Jones and associates have a lease on the No. 5 mine and started operations. As soon as they draw the water from the shaft they expect to be able to produce ore. The shaft is down 170 feet.

Ward, May 29.

(Special Correspondence).—The closing down of the smelter at Golden will have a bad effect on the shipper from this county, as a large number were already making shipments and others preparing to start operations. The treatment charges were low enough to permit shipments being made of ore that heretofore was thrown over the dump or left in the ground.

Boulder, May 28.

Manager Lake of the Boulder County mine says that the tunnel which will connect the company's mine and mill has been driven 2800 feet and is within 500 feet of the workings. The bore is being driven at the rate of 200 feet a month.

#### Clear Creek County.

The Waldorf Co. expects to have the mill at the Stevens mine, near Georgetown, in operation soon. The close-down was caused by a lack of water to run through the winter. On account of a lack of early winter snows in this region everything froze. To obviate this, provisions will be made during the summer to insure sufficient water and power to run the mill the entire winter.

Work has been started on the Arapahoe claims in the Argentine district by O. Hoffman and C. Gleen. The Democrat Mountain M. Co., a reorganization of the Kelly tunnel holdings on the east side of the mountain, is putting in a raise from the Bonanza tunnel level to connect with the workings now being carried forward on the Edgar lode. The ore body on the Edgar measures 18 inches in thickness, but according to the dip of the vein a junction of the Edgar, Rogers and Jordan lodes will be reached within another 50 feet of sinking. The Headlight shaft, on the American Sisters property, on Silver creek, above Georgetown, is being sunk another 150 feet. This shaft is down 190 feet and, according to surveys recently made, the ore shoot will be reached inside of another 100 feet. This work is being started to cut under the old workings at an increased depth. A compressor, boiler and engine have been put in. The American Sisters property is being developed by the American Sisters Leasing Co., a corporation composed of Georgetown men, with J. J. White and H. J. Crist as managers. Ground is being broken for the New Era mill at the base of Saxon mountain. This mill will have a capacity of 100 tons daily. C. Dubois of Denver has charge of the construction work. Manager Shepard states that finances are now in the treasury for the carrying out of all plans both for the New Era mill and also for the development of the Anglo-Saxon mines. A tramway has been completed which runs from the Saxon-Extension tunnel to the base of the mountain. Work on the Mazepa property on Democrat mountain is pushed, and it is expected to cut the Mazepa lode within another 100 feet. Steady shipments are being made from the Santiago. Shipments from the Lebanon tunnel near Georgetown have been begun by Maxton & Storms, who hold the property under bond and lease. It is understood that Maxton & Storms will begin work on the construction of a 50-ton concentrating mill.

The Colorado & Southern Railway Co. has ordered that, except where otherwise specifically provided, the minimum weight on ore and concentrates between all points in the Clear Creek district will be the marked capacity of the car, to be effective June 1, 1905. This means that a shipper sending ten tons will pay freight

on fourteen or more tons, according to the marked capacity.

A rich strike is said to have been made in the Harris lode, in the Argentine district. The streak of ore measured from 1 to 4 inches in thickness and reported assay values give 22,000 ounces in silver to the ton. The strike was made by W. Farragher, who has been operating the property under lease for several months. The Harris is near the Continental divide and is being developed by a tunnel, which is in over 200 feet. The Harris lode is owned by P. J. R. Manogold and T. Harris of Georgetown and A. Hammer of Chicago. The Crow Foot drift in Griffith mountain, near Silver Plume, is in 1800 feet. The Centennial mine, owned by D. Kennedy, in Georgetown, has opened an ore body in drifting from the fifth level. A. Santa has given a contract for driving the crosscut tunnel on the Big Blue mine an additional 100 feet. This property is on Saxon-Extension mountain, near Georgetown, and the crosscut is in 905 feet. The Hazelton-Santiago M. & T. Co. has let a contract for a 40-ton concentrating mill on its property in Argentine district, above Georgetown. The Allan mill at Idaho Springs has been started on ores from the Cardigan mine, above the Stanley. Metty Bros. have the mill under lease.

#### Custer County.

The Bassick at Querida is being worked under the management of C. E. Anderson. The new shaft is 1800 feet deep and connected with the old one, which is 1500 feet down, by sixteen levels. The entire property is worked by leasers, who do the development and extract the ore, sending the high grade to the smelters direct and the low grade to the Lacy concentrator at Wickliffe. The crater of the Bassick has been cut by a cross-cut for 700 feet east and west, and much workable ore exposed. To the north and south it extends for half a mile. The company's mill, which was destroyed by fire last year, will be replaced by two new ones during the present year.

#### Gilpin County.

Semans & Edwards of Bald mountain have leased the Aetna-Kent mine in Nevada district from J. A. Thatcher of Denver. Iowa parties will put in a 60 H. P. boiler on the Gauntlet mine on the east end of Quartz hill, near Central City, and will deepen their shaft from the 500-foot level.

The Pozo mine in Nevada gulch is shipping three cars of concentrates and ores each month to the Colorado Zinc Co. of Denver. It is owned by W. J. Lewis & Son of Central City and is being worked under a lease and bond by Denver parties. President J. P. Cappeau of the Russell M. Co., operating in Russell district, is making arrangements to resume mining about June 1. It is expected that machinery will be put on the shaft.

President J. C. Nixon of the Roderick Dhu Gold Mines Co., near Central City, says that the company is arranging for active operation of the entire property. No attempt at production will be made for six months, only the ores taken out in development being shipped. The company will discontinue leasing in the Protection shaft workings, which are down 557 feet. The main shaft on the Roderick Dhu is down 300 feet, this shaft being sunk through the old workings to virgin ground, which they expect to strike at a depth of 400 feet, and they intend to sink several hundred feet in order to open up new ground. The Quartz hill tunnel drains the property to a depth of 600 feet and the Newhouse tunnel, which will run 300 feet east of the property and will cut it at a depth of 1800 feet, is expected to also drain the surrounding territory. Leasers have been taking out good ores from the 334-foot level of the Protection mine. Eilmann & Co. are working their lease on the Susan Mary mine near Lake gulch, and intend to put up a whim and sink deeper on the shaft north of the main workings. Persig & Co. of Black Hawk are sinking a shaft on the Plymouth claim, an extension of the Carr on Bobtail hill, and will put up a small plant of machinery if their prospects hold out. Sinking operations are being carried on with day and night shifts at the Caledonia property in Lake district by the New National Tunnel M. Co. The main shaft is down 500 feet. They intend to sink an additional 300 feet, which will bring them to the level of their tunnel workings that are coming in from North Clear creek, and will mean the future handling of all ores as soon as the connections are made, giving them drainage as well as improved ventilation facilities. G. W. Adams of Central City is manager. The Justice mine in lower Russell district is being operated under a lease and bond by J. F. Stanish of Central City. Operations have been temporarily suspended at the Alva Adams property in Russell gulch on account of the large amount of surface water which that property is making. Sinking operations have been suspended at the Pittsburg shaft of the Cashier G. M. & R. Co. in Russell district, near Central City, the shaft being down 720 feet. The 700 east level has been started. Water difficulties stopped sinking in the winzes below the 600-foot east level, which will be remedied effectively as soon as the 700-foot level is in far enough to drain off the water. B. L. Campbell is superintendent and W. Auger foreman. Mitchell & Sons are drifting west at a depth of 360 feet in their Gulch mine in Lake district. They are also crosscutting at a depth of 80 feet. The Town Topics G. M. Co. intends to continue the East Notaway shaft in the Russell district to a depth of 1000 feet. Sinking has stopped for some time on account of bad air, and connections are to be made from the bottom level west to the 555 level, after which sinking operations will be resumed. T. Martin is superintendent at the mine and S. A. Josephi of Denver president and manager. A rich strike is reported in the 200-foot level of the Eldorado mine in Russell district, being worked by the Eldorado M. Co., S. T. Harris, manager. It is reported that a larger plant of machinery and new shaft building is to be put up on the property.

#### Gunnison County.

The Sunlight G. M. Co. has opened rich ore in its tunnel on Beacon mountain, near Sherrod. The tunnel is in 200 feet and the vein was opened in a drift from the same. W. M. Beacon, superintendent of the Gunnison line of the Colorado & Southern, and J. M. Herbert are interested. The N. B. C. Mining Co. has let a con-

tract to drive a tunnel into Brittle Silver mountain 500 feet. The Nannie Sherrod and Pay Well Mining Companies expect to resume operations soon. The Buena Vista M. Co. is making preparations to do extensive work on its properties at Hancock. The company is running a long tunnel into Mount Chapman. The Camilla Co. will resume operations on its tunnel into Pomeroy mountain north of Hancock.

The Spring Valley G. M. & R. Co. has a lease and bond on the Midland mine, 12 miles south of Gunnison, and has put men to work. F. Winters is manager. He has started a tunnel to cut the vein 100 feet below the present shaft. The tunnel will be driven 800 feet, giving it 400 feet of depth on the vein.

#### Lake County.

At a depth of 320 feet a body of good sulphide has been opened in the Corona, California gulch, near Leadville.

The Dome claim of the Iron Silver M. Co., on Rock hill, Leadville, has commenced shipping. A new shaft is to be sunk on the Georgia claim to aid in developing the Reindeer on Rock hill, Leadville. On account of the backward season but few placer claims have resumed work, but as the snow is rapidly disappearing the owners of placer ground at Alicante and other sections expect to get to work by June 1. Work has been resumed on the Tom Starr placer, at the foot of Harrison avenue, in California gulch. The Twin Lakes placer is being worked with three hydraulics. It is expected that the ground from Malta down to Hayden, on the Arkansas river, will be worked this season. Last fall the Saguaque G. M. Co. got an option and lease on the ground from opposite the old Union smelter down to Malta, and the terms of the lease were that a dredging machine had to be put in and the ground worked systematically, but it is doubtful if the ground will be worked this season. Sinking has been finished on the Nil Desperandum, on Rock hill, and drifting started in southerly direction. The Last Chance shaft, 500 feet deep, on East Fryer hill, near Leadville, after being idle for two years has resumed work. From the bottom of the shaft a drift will be run east 200 feet to catch the ore shoot that is believed to pass through that part of the property. The work is in charge of B. Dubois.

At the Sunset mine, on the northern slope of Twin Peaks mountain, operated under lease and bond by the Twin Mountain M. & M. Co., with T. Henneberry of Twin Lakes as manager, a new trail will be built to the upper workings, an underground survey will be made in the deep tunnel to locate the ore bodies, and the ore in sight will be extracted and shipped as soon as possible.

#### Larimer County.

It is reported that the Mt. Zirkel property, south of Pearl, is to be pumped out preparatory to examination. The Mt. Zirkel has been idle for two years, and has a well timbered shaft 285 feet in depth. The veins near Pearl occur in fissured zones in the granite-gneiss, the vein filling being altered country rock with variable gold and silver-bearing copper ores associated.

#### Montrose County.

A late dispatch reports a cave-in occurred May 30 in the Gunnison tunnel, one of the largest irrigation projects of the United States Government, entombing twenty-seven workmen, killing at least five men and seriously injuring two, who were pinned under heavy timbers, and would have been drowned but for the efforts of their entombed companions, who improvised a dam to hold back the water which poured into the tunnel for a time. Twenty-one men were rescued uninjured, but exhausted by their experience. They were hoisted with ropes through a shaft which had been sunk 60 feet in less than twenty-four hours. The rescuers worked in three-minute relays until the tunnel was reached. When the heavy timbers of the roof of the tunnel were broken the entombed men were found standing in water above their knees and still working with a will to prevent further disaster, as the soft dirt was constantly sliding. The cave-in occurred beneath the bed of Cedar creek, and was primarily due to the softened earth caused by seepage from the creek.

#### Ouray County.

Near Iron-ton work has been started on the Harrison lode, on Brown mountain, by Dr. Burrows on the Greyhound group in McIntyre gulch, on the Beaver, Belfast and Bellevue, and on the W. C. Davis Minneapolis group. West of Iron Park the Kennedy, Kimball and Lyons are being worked.

#### San Juan County.

Trails to the mines are being opened up and it will soon be possible to transport supplies to many properties which were running short on account of the unusually long winter. In the hills the snow lies at great depth, and it will be fully a month before mining operations can be generally resumed. The Red Mountain Railroad is snowed in. The Silverton Northern line from Eureka to the Animas Forks section is blocked by snow. The snowfall has been very heavy and as a consequence all mining operations in the district have been retarded at least one month. Operations have been resumed on the Tom Moore, north of Silverton, by Manager S. G. Martin. The water supply for the Highland Mary mill, on the ground of the Gold Tunnel & Railway Co., up Cunningham gulch, 8 miles from Silverton, is obtained from a lake 1½ mile farther up the mountain. Owing to the severity of the past winter the pipe line has been cracked by frost, stopping work at the mill until it can be repaired, probably by June 15.

The Mogul M. Co. will build a \$250,000 concentrating plant at Gladstone, 9 miles north of Silverton. The structural part of the new mill will be of concrete and steel and will be equipped with forty stamps, concentrating tables, tube mills for regrinding, etc. The Mogul mines are 2 miles from Gladstone, near the head of Cement creek, and in order to transport the mineral from the mines to the mill an aerial tram line 8000 feet in length will have to be built. The zinc product will require special treatment by magnetic separation.

It is reported that L. Jakes of Grand Junction will operate a custom mill and testing plant at Silverton.



## San Miguel County.

The mines and the 50-ton stamp mill at Ophir Loop, owned by the Ophir Con., have been sold to satisfy the demands of the Mine & Smelter Supply Co. of Denver, by whom it was bid in for the amount of the claims—\$3660 and costs. The mining company will doubtless regain the property in the near future.

## Summit County.

A new hoist and equipment is being put up at the American Flag mine, near Park City. Water has caused a temporary stoppage of work at the 800-foot level of the New York Bonanza at Park City.

C. A. Finding has started work on the Minnie mine, near Breckenridge. The Oro mine, near Breckenridge, is being worked by J. McGarvie.

S. C. Huntington, W. E. Stouffer and J. Bernatchio have taken a contract to sink the Loring shaft, on the Bemrose placer, near Breckenridge, 100 feet deeper. The King Solomon Tunnel Co. at Frisco is putting in air drills to complete the driving of its big tunnel.

## Teller County.

Superintendent R. D. Wattles of the Bull Hill M. & D. Co., working the Crosson property on the Raven hill side of Eclipse gulch, Cripple Creek, is timbering the main shaft from the 300-foot level to the surface, preparatory to taking out ore from the vein recently struck. The Morning M. & L. Co. are straightening the shaft of the Aileen on Guyot hill, Cripple Creek, preparatory to sinking and developing. Lessee Granfield, operating the C. K. & N. property on Beacon hill, Cripple Creek, has a station at the 800-foot level and started drifting to open up the vein system which has been worked in the levels above. Sinking will be resumed until the 900-foot point is reached.

P. G. Conover is starting work on the Janie Dix and the Holmdell claims, at the head of Twelfth street in Goldfield. These claims lie on the Big Bull mountain, which has yielded no ore of consequence, although subjected to surface exploitation at several points. It is reported that the 240-foot three-compartment shaft on the Ocean View, at the northern end of Battle mountain, Cripple Creek, is to be sunk to a depth of 1000 feet. A roaster is to be added to the equipment of the Cripple Creek Cyanide Co., owner of a cyanide mill near Gillett. Manager W. G. Beyerly has been in Chicago buying machinery. J. E. Bergeron has taken a two-year lease on the Lillie mine and the Lucky Friday lode of the Vindicator Co. of Cripple Creek. High-grade ore has been found by L. Inskeep, prospecting the south block of the Agnes property, on the northeast slope of Beacon hill, Cripple Creek. Work is being done on the bottom level at a depth of 100 feet.

At a recent meeting of the Doctor-Jack Pot directors, they accepted a proposition made by McAllister & Gandy to take the mine for a cash consideration of \$75,000, thereby liquidating the company's indebtedness of \$65,000 and leaving \$10,000 cash balance in the treasury of the new company which McAllister & Gandy agree to form. This sale will prevent the foreclosure of the mortgage on the mine in the district court at Cripple Creek. On the Bonnie Nell property, owned by the Merger Co., of Cripple Creek, Manager Storke is sinking to the 1000-foot point from the 600-foot level.

The Exposition Mines Co. of Cripple Creek, operating on the south end of the Burns claim of the Acacia Co., have commenced sinking the shaft an additional 100 feet. Lessee J. Wright, leasing Blocks 240 and 241 of the Stratton-Cripple Creek M. & D. Co.'s estate, has put in a large compressor and will put in several machine drills at once. Block 211 of the John A. Logan mine from the surface down to the 500-foot level has been leased to the Logan M. & L. Co., of which B. P. Anderson, I. Howbert and J. A. Himebaugh are stockholders. Other leases have been granted by the Stratton people on Blocks 170, 171, 172 and 173 of the Longfellow property to R. P. Russell of Cripple Creek and on Block 229 of the Nightingale to G. Ferriek of Cripple Creek. The property of the Black Belle Co., on Beacon hill, Cripple Creek, is being worked by the Cripple Creek Gold Temple M. Co., operating the south 750 feet under lease. As surface water is leaving the property, the management is making arrangements to sink another 100 feet, giving the shaft a depth of 405 feet.

The shaft of the Teutonic, Cripple Creek, is to be sunk 100 feet from the 300-foot level by Duncan & Cam, using machine drills. The Gold Coin Co. will start unwatering the lower level and will open up the extension of the Gold Coin-Dorothy veins. Plans have been made for a compressor and another boiler for the Blue Flag properties on Raven hill, Cripple Creek. The shaft is down 200 feet. J. F. Erisman is president and manager and C. H. McCrew superintendent.

The McKinney Extension G. M. Co., of Anaconda, has put in machinery and is sinking the shaft to the 300-foot level. When the shaft reaches a depth of 100 feet lateral work will be started. Lessee W. P. Dunham, operating under lease blocks 3, 4 and 5 of the Jerry Johnson estate, Cripple Creek, is sinking the shaft 4½x9 feet in the clear, to the 400-foot level. The K. C. Mining Co., operating a part of block 3 of the same property, is east and west from the shaft at a depth of 100 feet.

## IDAHO.

## Ada County.

At a meeting of the directors of the American Exploration Co. at Boise, it was decided to put in a 4-drill air compressor on the Nellie mine, to push the work of driving the crosscut tunnel. The compressor will be run by electric power. The tunnel is in over 200 feet and is expected to cut the vein. As soon as the vein has been cut, a 100-ton cyanide plant will be built.

## Boise County.

Superintendent V. Thorne reports that the shaft on the John Henry group, near Idaho City, was sunk 415 feet in seven months. The shaft has three compartments. F. Day has been foreman. The John Henry and Democrat ledges will be tapped from the 400-foot level, where a station is being cut. J. Sullivan reports that the incline on the Mammoth mine, on Summit Flat, near Idaho City, is down 400 feet and a station is being cut.

## Elmore County.

It is reported that the Providence Investment Co. is preparing to build a 10-stamp mill on its Mountain View property near Pine and to construct an electric plant on the South Boise river, 2 miles from the mine, with a capacity of 400 H. P., sufficient to operate the mill and furnish power for the mine. They expect to have both the mill and the electric plant in operation by Aug. 1. The tunnel of the Mountain View mine is in 500 feet.

## Idaho County.

The State Wagon Road Commission has decided to build the Warren-Big creek wagon road, conditional on the citizens of Weiser and the upper country paying half the cost. The total expense of constructing the road is estimated at \$20,000. The route of the proposed road leads from Warren up Warren creek to its head over the summit to Pony creek, down that stream to the south fork of the Salmon, up the south fork to Elk creek, and up that stream to the Elk creek summit, thence to the Werdenhoff mine on Big creek. It is hoped to start work by June 25.

The Copper King Co., which is operating seven mines on the divide between the west fork of Rapid river and the east fork of Granite creek, in the Seven Devils district, is getting satisfactory results from the development work. A winze is being sunk from the tunnel level on a chute of high-grade ore. The ledge is 15 feet wide and has a paystreak 3 feet wide of hornite ore. The company is building a wagon road from the mine to connect with the Kleinschmidt road to the Peacock mine, and will begin shipments to the Landor smelter as soon as this road is finished; they have drifts opened up on the 500-foot level in the winze. C. McKinnis of Mace is general manager.

F. Brown and F. H. Wood of the Jumbo mine at Buffalo Hump report that the Jumbo, Cracker Jack and Mother Lode No. 2 are working full crews. The Hump is covered by 3 feet of snow. The Jumbo is working forty men. The full battery of twenty-four stamps is running. The chlorination plant is saving 95%. They have contracted for a 50-ton cyaniding plant to treat the tailings from the mill and chlorination plant, and expect to put it up in July. The Crackerjack is working twenty men and running twenty stamps. On the Mother Lode No. 2 thirty men are at work.

## Nez Perce County.

J. M. Edwards, manager of the Ohadi M. & M. Co., expects to put in a 15-ton stamp mill in Garden gulch, 35 miles up the Snake river from Lewiston. Five ledges have been opened on the property.

## Shoshone County.

The Bitter Root Mountain M. Co. is developing six claims on the hill south of the Morning mill, on the south side of the south fork of the Cœur d'Alene river, near Mullan. They have started a crosscut tunnel on the north side of the hill to tap the ledge at a depth of 425 feet; 470 feet of this tunnel has been completed. The company is developing six claims 4 miles from Wallace and is running a crosscut tunnel to open it at depth. F. A. Edgerton of Spokane, Wash., is secretary and manager of the company and C. F. O. Merriam is consulting engineer.

The stockholders of the O. K. Con. M. & M. Co. at Wallace have elected J. W. Flink president and manager, E. Pfister vice-president, A. Matt secretary, E. McIntosh of Kellogg and W. Hoare of Tekoa, Wash., directors. The principal work will be centered upon the Mabel claim. It will require 600 feet of tunnel work to intersect the ore shoot at a depth of 250 feet. The Laclede M. Co. has started up its new compressor near Wallace. Only one machine drill will be used for the present. On the surface and in the upper tunnel the Laclede has a fine shoot of ore which it is now aiming to open at a vertical depth of 200 feet by driving a second crosscut tunnel which is now in 200 feet and is estimated to have 400 feet yet to run to cut the ledge.

Old mining properties in the Cœur d'Alenes that in former days have been numbered among the most prominent mines in the district, but which during the latter days have been practically idle, are now being revived and worked. In the Nine Mile district, near Wallace, the California, the Granite and the Custer are being operated. The California Con. has been acquired by a Pittsburg corporation, and men are employed at the mine and mill. Shipments are being made and development work done. The Granite mine has been taken over by the Success M. Co. During the early days of quartz mining in the Cœur d'Alenes this property was considered among the best. By reason of the prevalence of zinc the ores finally could not be profitably worked and the mine became idle. H. F. Samuels took an option on the property, experimented with the ores, learned that they could be worked by a new process and then organized the Success M. Co. Miners are engaged in development work, and a mill is being built, with a view to saving the zinc values as well as the silver and lead. W. R. Swicegood has a number of miners employed on the Custer.

## Washington County.

C. Green, president and general manager of the Idaho Placer M. Co., whose properties are at Old's Ferry, 12 miles west of Weiser, on Snake river, has launched the new dredger and the machinery will be put in as it arrives. The boat is 80 feet 8 inches long, 30 feet 8 inches wide and 4 feet deep. It is built of Oregon fir.

## MISSOURI.

## Jasper County.

The News-Herald of Joplin reports that the Paragon mine and mill, near Joplin, have resumed operations. J. W. Brooks & Co. are getting out good ore on the Schifferdecker land. The Eden M. Co. is drilling on its lease near Joplin. A steam hoist derrick is being put in at the Chuck Luck mine at Four Corners. In drilling east of Belleville, Campbell & Co. struck a large cave at a depth of 90 feet. The Ross M. Co. is draining its mining land and will start up its new mill. The Togo M. Co. has made an excellent drill strike on the Roh Roy lease, 1 mile south of Villa Heights. F. E. Carringer of Denver and J. Vancil of Joplin have leased 200 acres northwest of Oakland and will do 2000 feet of drilling. Scott, Mooneyham & McCarthy have put in

a steam drill and 2-inch steam pump in their prospect at Smelter Hill. A shaft is being sunk on the Schifferdecker land by Messrs. J. F. and W. M. Meese and G. Pulley and W. A. Moses. A shaft has been begun on a four-lot lease on the Schifferdecker land by N. Wheeler, J. Stenson and C. Keller. The Blatz-Weiner Co. is preparing to sink an air shaft at its diggings on the Hunt land, north of Belleville. Bad air has stopped mining operations there. J. A. Stokes & Co. are down 80 feet with their shaft on the Falace 40-acre tract. Jeffries & Co. have commenced hoisting dirt in their prospect on the adjoining lease.

A. Hardy, Sr., of Webb City, has purchased a mine from the F. M. Sponable M. Co. at Neck City. T. N. Davey, U. Hendrickson, W. H. Phelps and H. C. Cnwgill have purchased from M. A. Moseley a one-fourth interest in eighty acres of land 2 miles south of Webb City. G. H. Davis, manager of the Ozark Lead & Zinc Co., has drained the company's land in the Center creek bottom and will place a large pump. Two mills will be begun on the company's land. W. G. Sheldon, of Cartersville, general manager of the Gilt Edge M. Co. at Diamond, reports that his company has thoroughly drilled the bottom of the drift in its mine and finds that it has at least 15 feet of good ore under present workings. The shaft will be sunk deeper and the new stope taken up. The Missouri Blanket Vein Co. has purchased the Squares & Smith mill near Diamond and will have it moved to their new mine at Wentworth. E. Gilbroath, of Cartersville, has the contract.

## MONTANA.

By a decision by the Secretary of the Interior, thousands of acres of the school land of Montana, including that which is most valuable, are to be preserved to the State. The Secretary holds that these lands claimed by the State for school lands are more valuable for minerals than for agriculture, and though such lands were known to contain minerals prior to the date of the admission of the State into the Union, the lands may be held by the State as school lands, notwithstanding their mineral character, unless they had been located or claimed as mineral land prior to November 8, 1889, and that development of mines subsequent to the admission of the State, though the deposits of mineral were known prior thereto, cannot affect the title of the State to lands donated by act of Congress to the State for the benefit of the public schools.

## Beaverhead County.

The Amalgamated C. Co. is working thirty men on its Indian Queen property on Birch creek, Dillon, under the direction of J. Willoughby. The shaft in the long tunnel is 150 feet deep. A new and larger engine has been ordered. The new shaft is a double compartment and is 800 feet from the mouth of the tunnel. Four men are extracting ore from the old workings.

## Deer Lodge County.

The Cable Lease M. Co. has interested capital in its property, 17 miles west of Anaconda. The workings of the Cable are being drained. The tunnel level is 240 feet below the outcrop. In addition to the work on the Cable, the company is sinking a shaft on the Royal Charter and is down 65 feet. The mill will not be started until there is ore enough in sight to keep it running steadily.

## Fergus County.

Superintendent H. H. Lang of the Kendall, at Kendall, states that rapid progress is being made in constructing the cement foundation for the hoist that is to be used in sinking the new compartment shaft.

## Jefferson County.

It is reported that an English company, under the direction of Wm. Brazenall, expects to start dredging operations in the Jefferson river, near Jefferson island.

## Madison County.

The Mammoth M. Co. at Mammoth is employing twenty-seven men and expects to increase the number to seventy-five during the summer. This property owns its own electric plant, furnished from the waters of South Boulder. Compressed air drills are used in driving a 3000-foot tunnel, which is being run to tap the ore bodies at a depth of 1500 feet, on a level with the mill. The Cliff mine at Mammoth, owned by A. Laden and others, is under bond and lease to Seattle parties, who are driving a 400-foot tunnel to develop the ore deposits at depth.

The shaft of the West Colusa at Butte is down 1600 feet and a station is being cut at the bottom. The Blackrock Co. at Butte will sink from the 450-foot to the 550-foot level.

It is reported that the Watseca M. Co. at Rochester will cyanide its tailings dumps.

At the Revenue mine, on Richmond Flat, near Pony, there are 48 miners working, 30 leasers and 18 men, employed in the mill and mine by the company. The company buys the ore from the leasers and treats them in their mill. The ore is treated by the cyanide process. The mill has a capacity of 75 tons per day. R. C. Knox is superintendent, A. Shay is foreman of the mill, and E. Williams foreman of the mine.

## Park County.

J. Hall and R. L. Morton report high-grade ore in the Bi-Metallic mine of the Crown Butte group at Cooke. The ore carries values in gold, silver, lead, copper and bismuth.

H. G. Merry, manager of the Montana Coal & Coke Co. at Aldridge and Electric, has made satisfactory arrangements with the striking miners and work is being gradually resumed.

## Silver Bow County.

The Leadville M. & S. Co. has started work 18 miles north of Butte, under the direction of A. Cottrell.

## NEVADA.

## Elko County.

Plans have been completed for the 1000-ton concentrator of the Nevada Con. C. Co. at Ely. It is expected that the railroad from Toana to Ely will be completed by September 1.

## Esmeralda County.

At Silver Peak the mill of the Mohawk-Alpine Co. is running night and day. J. Chiatovich has started his



mill.—In the Palmetto range, southwest of Silver Peak, several properties are being opened up.

#### Lander County.

The Austin G. M. Co. has been formed with Wm. Easton of Austin as president and T. H. Dalton of Austin as secretary and treasurer to work the Last Choice mine, 1 mile southwest of Austin.—L. D. Gordon has leased F. Pedroncini's interests in the McManus-Pedroncini mine near Marshall canyon near Austin, and McManus & Gordon will put men to work taking out ore. Ore is being shipped from the New York canyon mine, at Battle mountain, Mont., by Superintendent R. Watt.

(Special Correspondence).—There is some excitement in the camp of Bullion, 20 miles south of Beowawe. C. Montgomery and A. Catenhaun have struck good values, and are said to have given a bond to the Amalgamated C. Co., Butte, Mont., for \$150,000. The new strike is 16 miles northeast of Cortez in Bullion and Clipper canyons near the Eureka-Lander county line. Battle Mountain, May 31.

#### Lincoln County.

The Gold Coin M. Co. is operating the Sazerac and Vinona groups at Dupont, 12 miles from Searchlight. C. Anderson is general manager. A gasoline hoist has been placed on the Sazerac.—At the Paralle property, near Searchlight, under the direction of T. D. Forney, sinking in the main shaft has been discontinued.—Work is being rushed on three claims, the Bonanza King, Black Prince and Golden Eagle, 12 miles northwest of Searchlight, in the Crescent range. A shaft is being sunk on the Black Prince which will be put down to water level. J. Bindschadler has charge of the work.

#### Nye County.

F. Griffith and J. W. Montgomery of Los Angeles are at the head of the company intending to put up a 10-stamp mill near Beatty. A contract has been signed to work the ore from the Bullfrog M. Co.'s property. At first the motor power will be gasoline, but later electricity.

The Tonopah Cash Boy M. Co., at Tonopah, has put in a 50 H. P. steam hoisting engine and a 50 H. P. hoiler, capable of sinking to a depth of 1000 feet. L. A. Blakeslee is president and S. Crossley of Los Angeles, Cal., is superintendent.

#### Washoe County.

P. Waldron, Jr., manager of the Harris mine in Jumbo district, 4 miles from Washoe City, reports that company is employing four miners in preliminary work and will soon increase the force. The mine is being worked through a tunnel in 500 feet and from it a shaft has been sunk 400 feet.

The Pittsburg Co., which has bonded the Ora claims, has started work.—H. Hawkes of Colorado Springs, Colo., has an option on the extension group of the Ingalls Dispensia claim, near Olinghouse, of J. C. Effricks, W. Kearney and J. D. Poole.—O. M. Pudor of Houston, Texas, has purchased the No. 2 mine at Olinghouse of Rice & Howard for \$22,500.

#### White Pine County.

M. McGarry intends to resume work at the Cornell lead mine, at Hamilton.

### OREGON.

#### Baker County.

P. Humbert of San Francisco has resumed work at the Cornucopia mine, at Cornucopia, under bond.

The President has created a forest reserve in eastern Oregon to be known as the Wallowa reserve, and is on the Wallowa mountain range, which forms the dividing line between Baker and Wallowa counties, and is in Baker, Wallowa and Union counties. Eagle creek, Cathrine creek, Innaha river and smaller streams are the outlet to the watersheds covered by the reserve. The timber is mostly yellow pine. The Cornucopia, Tenderfoot and Innaha mining districts are affected, as the first two are believed to be entirely within the bounds of the reserve, and the latter's timber and water will come from it.

The Empire group in the Cracker Creek district, near Sumpter, is being developed under the management of A. M. Harris, who has interested Detroit, Mich., capitalists in the mine.—The E. & E. mine at Bourne is preparing to shut down work in the stopes temporarily. Sinking and developing operations will be continued with a smaller force. Greater pumping facilities will be added for handling the increased flow of water that will result from extending the shaft.

W. E. Gifford has found the main ore shoot on the Present Need mine, near Quartzburg, and is shipping to the Sumpter smelter.—Work has been commenced on a lime deposit, near Durkee. A spur is being built from the O. R. & N. main line to the mine and one kiln is at work, burning 100 barrels daily. More kilns will be put in soon. F. Nelson is manager of the White Crystal Lime Co., which controls the property.

#### Jackson County.

J. H. Leggett and Co. of Oroville, Cal., are prospecting ground near Willow Springs, 9 miles from Medford, preparatory to putting in a dredger. Other companies are prospecting and holding land in the same district.

#### Josephine County.

In the Sucker Creek district the Gold Pick claim, located last year by F. Fowler, has been purchased by Matthews & Hull for \$6000. The ledge outcrops on a steep hillside and into this two tunnels have been driven, tapping the vein to a depth of 120 feet.—The Briggs claims in the same district, sold last year for \$110,000, are being developed by the Gold Bar M. Co. of Chicago.—The Sucker Creek district is on the boundary between California and Oregon and is reached by a wagon road 40 miles from Grants Pass to Holland and from Holland 20 miles by trail.—A. H. Mead of Grants Pass and C. C. Case of Cottage Grove are said to be opening up good ore in the Black Oak mine in the Jones Creek district, 3 miles east of Grants Pass.

### SOUTH DAKOTA.

#### Lawrence County.

The Clover Leaf M. Co., working the Uncle Sam mine, at Roubaix, expect to have their 60-stamp mill crushing

rock during June. They intend sinking to the 1000-foot level and also enlarging the mill.

The 120-stamp mill and cyanide plant of Horseshoe M. Co., at Terry, has been burned. It was the largest wet crushing cyanide mill in the Black Hills.

J. B. Taylor of Rochford, S. D., superintendent of the Black Hills C. Co. and of the Burlington G. M. Co., will resume operations on both of these properties during the coming month.

The annual report of the Spearfish G. M. & R. Co. at Cyanide, for the year ending May 1, 1905, shows that 2133 feet of drifts have been run on the second or lower ore zone at the Black Diamond workings on development account. Since January 1, 1905, the larger part of the mill tonnage has been taken from ore bodies opened up by this work and lying about the whim shaft. Attention is called to the rise in the mill tailings since January. From May 1 to January 1, the mill tails averaged 53.5 cents, while from January 1 to May 1, of this year, the average has risen to \$1.14, due to a change in the character of the ore, it being very much denser than the ore from the upper contact. It has been found by mill tests that by crushing this ore to six mesh, instead of three mesh, as formerly, an additional saving of 40 cents can be made. Therefore, the management has ordered the one additional set of rolls, elevator and screens needed for this finer crushing. D. N. Heizer was elected president; W. C. Frost, vice president; C. E. Heizer, secretary and treasurer.

At the annual election of officers of the Big Four G. M. Co. at Deadwood, G. L. Allen was elected president; A. N. Beal, treasurer; B. G. Franklin, secretary, Hamburg, Ia.—The Gladiator G. M. Co. intends to start work again on its property in Deadwood gulch, northeast of Lead.

#### Pennington County.

Satisfactory results are reported from the Redfern mine, near Redfern. The company expects to build a mill on the property this summer.

### UTAH.

#### Juab County.

Work has been resumed on the Lilly property, near Eureka. The shaft is down 275 feet.—Near the Lilly mine, the Big Hill claims are being worked by J. Bestmeyer.—Satisfactory arrangements having been made with the smelters, work at the Swansea mine, at Silver City, will be resumed.

Superintendent S. McIntyre has 112 men at work for the Mammoth M. Co. at Eureka.—Superintendent A. Boudry is opening up good ore on the 400-foot level of the Joe Bowers M. Co. at Eureka.

#### Salt Lake County.

The Continental-Alta at Alta has its bucket tram running.—The Columbus Consolidated mill is running steadily.—The Albion, the Quincy, the South Columbus, the Silver King, the Bryan and the Granite at Alta are all being worked.

The management of the Bingham and New Haven, at Bingham, has decided to build a 4600-foot tramway to make direct connection with the Copper Belt Railway line. At present the company is turning out an average of eighty tons of ore daily.

President E. L. White of the Bingham Con., at Bingham, says that on the Lark vein, in the Mascot tunnel, they are driving east and west and have exposed ore on the 1400-foot level. The copper values have run from 4% to 17%; silver, ten ounces; lead, 20%.—The Miner's Dream property has been drained and they will begin driving from the Mascot tunnel under the Miner's Dream. The tunnel will tap the property 600 feet lower than the lowest workings.—All the ore from the Dalton & Lark properties will hereafter be handled through the tunnel, which, in comparison with hoisting costs, will mean a saving in expense.—In the Eagle & Blue Bell they are down 950 feet and the shaft will be sunk 50 feet more.

Superintendent L. R. J. Morser of the Intermountain M. & I. Association, operating the Mystic Shrine in Bingham canyon, has recommended that the company put up a small concentrating plant to handle the second-class ore. F. G. Shaffer of Denver is manager.—S. Rogers is putting in concentrating machines near the Lead mill to handle tailings in the lower part of Bingham canyon.

#### Tooele County.

In the Erickson mining district recent discoveries of ore bodies carrying high values in copper have attracted attention. The Flying Dutchman, owned by H. Housh, T. Manion, and other parties of Grand Junction, Colo., is following the hanging wall down an incline for 100 feet. T. Manion, the manager, has been directed to crosscut the vein.

#### Utah County.

A circular address by the American directors of the Boston Con. M. Co. to its shareholders advises them of the action which has been taken that a provision may be made for the erection of a concentrator upon the margins of Utah lake. It is proposed to build a railroad from the mines to the millsite which has already been purchased by the company at Pelican Point, on Utah lake, together with equipping the mines with steam shovels for extracting from 5000 tons to 10,000 tons daily. President S. Newhouse advises that a mill of 2500 tons capacity be first erected, and, when completed, add another unit of 2500 tons to the mill, so as to give a capacity of 5000 tons per day. To show that a profit of \$1.25 per ton upon the copper-bearing porphyries can be obtained, he states that 1.4% copper equals 28 pounds copper; deduct 25% loss in concentration, 7 pounds copper, leaves 21 pounds copper; 21 pounds copper at 13½ cents is \$2.83; add gold and silver values, 20 cents, and there is \$3.03. Deduct—Mining cost with steam shovel, 40 cents; milling cost, 35 cents; smelting cost, 25 cents; 2 cents per pound copper for freight and refining—42 cents; for loss in smelting and expenses selling copper, 16 cents; hauling crude ore, 20 cents; total, \$1.78; \$1.78 deducted from \$3.03 leaves \$1.25. W. C. Thomas is superintendent of the site on the margin of Utah lake, upon which is to be built the town of Bostonia.

T. Symms has leased the Hilda mine in Beef Hollow, near Lehi.—W. F. Butt and J. N. Butt, who own a

mine near Simpson Springs, near Lehi, are preparing to ship ore.

J. A. Kauffman, superintendent of the Bingham Metals Co., claims to have copper porphyry on the Mt. Aetna group, 3 miles from Bingham. This is to be developed by a tunnel from Middle canyon.

The Buckley mine, in Rock canyon, east of American Fork, is under the management of Woodward Bros. of Provo, who are working two shifts, finishing the shaft, which will connect with the upper tunnel, from which they are extracting ore. The shaft will be used to supply air and facilitate the handling of the ore in the upper tunnel.—T. M. Alman of Provo is general manager of the Melha M. Co. of American Fork canyon.

—J. Armstrong and J. Burgess are working on the Clipper and Silver King property, in American Fork canyon.—Manager G. Tyng of the Wyoming mine, in American Fork canyon, expects to ship 800 sacks of ore in July.—A. Dickerson and W. H. King are at Mill Fork, of the American Fork canyon, near the Wyoming mine, building a road preparatory to putting in a saw mill to saw mining timber for the Wyoming mine. Geo. Pulley has started work at the Copper King mine, in American Fork canyon.

### WASHINGTON.

#### Ferry County.

The Oversight M. & M. Co., with ten claims 10 miles northeast of Republic, is exploring to find a place for a working shaft through which the vein may be developed.

The Belcher Mountain Railway Co., organized by the interests which are hacking the Belcher mine, at Belcher, near Republic, has an engineering corps in the field making the final location. T. M. Hammond, Jr., has charge of the engineering end. J. L. Harper, general manager, says that the road has been fully financed and negotiations are in progress for the steel and rolling stock. Mr. Harper, who is also manager of the Belcher mine, will buy 2000 feet of steel pipe line, a water wheel, a heavy electric generator and complete electrical equipment for the mine, capable of running eight drills. A gravity tramway 2000 feet in length will transport the ore and flux from near the top of Belcher mountain to the railroad bunkers at its base.

### WYOMING.

#### Fremont County.

The property of the Basin Copper M. Co. on Copper mountain, near Thermopolis, has been sold to P. Reisgaart of Alma, Colo., for \$150,000.

### FOREIGN.

#### AUSTRALIA.

##### New South Wales

Opal is found in Wallangulla in an outlier of the upper Cretaceous (sandstone), which comprises an upper bed of conglomerate 30 feet thick, which has in places been denuded, resulting in the formation of a low ridge and a lower bed of white, powdery siliceous rock. The conglomerate is composed of a number of quartz pebbles set in a vitreous ground mass. The lower bed contains the precious stones and is similar to the opal-bearing rocks at White Cliffs. The precious stone is scattered in an irregular manner through the rock and frequently occurs in a nodular form. The field has yet to be developed.

### CANADA.

#### BRITISH COLUMBIA.

The annual report of the British Columbia Minister of Mines for 1904 shows the following production of mineral by districts and divisions:

Name.	Divisions	Districts.
Cariboo District.....		\$474,600
Cariboo Mining Division.....	\$218,000	
Quesnel Mining Division.....	150,000	
Omineca Mining Division.....	11,600	
Cassiar District.....		\$558,573
East Kootenay District.....		\$3,210,573
West Kootenay District.....		\$5,806,070
Albermarle Division.....	\$168,023	
Nelson Division.....	466,633	
Slocan Division.....	1,236,558	
Trail Creek Division.....	3,760,866	
Other parts.....	173,640	
Lillooet District.....		\$34,583
Yale District.....		\$4,190,281
Osoyoos, Grand Forks & Greenwood Divis's.....	\$4,110,366	
Similkameen Division.....	2,500	
Yale Division.....	7,415	
Coast Districts (Nanaimo, Alberni, West Coast Vancouver Island, Victoria).....		\$4,702,679
Total.....		\$18,977,359

The amount and value of mineral products was:

	Weight.	Value.
Gold, placer, ounces.....	55,765	\$1,115,300
Gold, lode, ounces.....	2,2,042	4,589,608
Silver, ounces.....	3,222,481	1,719,516
Copper, pounds.....	35,710,128	4,578,087
Lead, pounds.....	36,616,244	1,421,874
Coal, tons.....	1,253,628	3,760,884
Coke, tons.....	334,102	1,192,140
Other material.....		600,000
Total.....		\$18,977,359

#### Boundary District.

Although mine and claim owners in the west fork of the Kettle river country have no railway nearer than the Canadian Pacific Railway terminus at Midway, yet developing the mineral properties is being actively undertaken. The Vancouver & Boundary Creek D. & M. Co., operating the Sally group, has completed a wagon road from Beaverdell, on the east side of the west fork. North of the town is Wallace mountain, on which most of the company's claims are located. The Sally group has ten veins, with a northeast and southwest direction, and a dip to the east. On vein No. 1, on the Sally, a tunnel has been driven 300 feet, with an 80-foot upraise at 100 feet. The ore contains a little gold and some gray copper, with most of the value in silver. Other properties being developed in the same district are the Wellington, on Wallace mountain, the Bounty, the Gold Drop Fraction, the Nanapsee, 2 miles from Wallace mountain, and the Curry group, on Curry creek



Experiments are being made to amalgamate and concentrate the values at the Carmi mine, where a small mill has been put up.

J. P. Graves, manager of the Granby Co., states that a new shaft, to cost \$100,000, will be constructed at once on the Victoria of the Granby group of copper-gold mines at Phoenix. It will have three compartments and will be excavated by raising above the 400-foot level to the surface. It will be equipped with a crusher capable of handling 1500 tons in ten hours. It will be the principal working shaft and through it about one-third of the mine output will be raised. That will put the mine in shape to produce from 4000 to 5000 tons a day. The seventh and eighth furnaces at the smelter, giving it a capacity of 2700 tons a day, will be running July 1. A ninth furnace may be put in this year.

L. T. Dickason, E. F. Johnson and W. Bailey of Chicago, Ill., have purchased the Preston mine, adjoining the Crescent mine, near Greenwood. Work has begun under W. H. Jeffery.

The new 80 H. P. boiler for the Providence mine near Greenwood has been put in place and development resumed.—The new incline shaft on the Emma, Summit camp, is down 130 feet, and is to be continued to 160 feet. Shipments have been resumed.—M. Kay will resume development on the Toronto, near the Skylark.—The Jewel mine in Long Lake is being unwatered. It is probable that as soon as the water is taken out of the mine, the drift will be continued into the Denoro Grande, recently bonded by the company from C. J. McArthur.

Ore shipments from Boundary mines for the week ending May 27 were as follows: Granby mines to Granby smelter, 12,080 tons; Mother Lode to British Columbia Copper Co.'s smelter, 3808 tons; Mountain Rose to British Columbia Copper Co.'s smelter, 33; Emma to Nelson smelter, 99; Oro Denoro to Granby smelter, 66; Skylark to Nelson and Granby smelters, 50 tons; Last Chance to Trail smelter, 30 tons; total for week, 14,166 tons; total for year to date, 378,204 tons. The Boundary smelters treated ore as follows: Granby smelter, 12,413 tons; British Columbia Copper Co.'s smelter, 4147 tons; total for week, 16,560 tons; total for year, 387,069 tons.

#### Cassiar District.

Regarding work in the Atlin district, the British Columbia Mining Exchange says that while the sluicing season started in early on the principal creeks, there were no signs of Atlin lake breaking up on May 10.—The dredger on Upper Spruce creek is to be completed this year. The same investors will build an electrically equipped dredger to operate on Tar Flats.—Ruffner's consolidated companies on Pine creek will operate with 7000 inches of water after the ditch is enlarged. McKee Creek Con. will also extend and enlarge its operations.—Spruce Creek Power Co. will be operated this year by W. H. Hall for the Denny-Blaine people of Seattle.—Otter creek will be operated this year under lease by J. M. Britt of Grants Pass, Or., and T. B. Raefield of Seattle, Wash. The management of the company will continue in the hands of O. T. Switzer and J. H. Brownlee.—The steam shovel for the Northern Mines, Ltd., will go into Atlin by the first boat. Meanwhile contracts have been let for getting out the necessary timbers. This company has acquired 2600 feet of the richest and best prospect portion of Spruce creek. A. H. Bromley and R. D. Fetherstonehaugh are interested in the company.

#### Roseland District

The tonnage of ore shipped from and crushed at the Roseland mines for the week ending May 27th and for the year to date was as follows:

Le Roi	1,875	53,355
Centre Star	1,820	37,920
War Eagle	1,320	26,850
Le Roi Two	80	3,953
Le Roi Two (milled)		2,800
White Bear	1,100	9,830
White Bear (milled)		3,725
Jumbo	100	3,894
Spitzee	30	1,977
Velvet-Portland		
Total	5,305	139,504

#### Slocan District.

Manager McPhee of the Ottawa mine, a dry property on Springer creek, near Slocan City, states that the owners intend to develop the mine by putting in a small compressor for the necessary power. The throwing open of the railway reservation lands by the Government on May 24 caused a big rush of locators, who have staked locations for timber, water and land near Kaslo, Slocan and on the banks of the Columbia above Trail.

### CHINA.

The United States Consul-General at Tientsin submits what is believed to be a complete schedule of mining concessions granted by the Chinese Government: In the three eastern provinces, to Russia, Karin, Chiapiku, Ningkuta and Hunchun. In Shantung, to Germany, all places along the Kiaochau Railway and almost the whole province; capital, \$60,000,000 Mexican. In Szechuan, to France, Kuanhsien, Kienwei, Weiyeun, Chikiang, Huchau and Chingking; capital, \$10,000,000 Mexican. In Shansi, to England, Menghsien, Pingting, Luan and Tsechau; capital, \$732,000. In Honan, to England, Huaiching and its neighborhood; capital, \$7,320,000. In Anhui, to Japan, Hsuancheng; capital, \$1,830,000. In Chehkiang, to Italy, Yenchau, Wenchan and Chuechau; capital, \$3,660,000. In Kuichau, to France. In Chihli, to Americans, Lowry & Jameson, gold mining claim.

### HONDURAS.

W. E. Alger, consul, Tegucigalpa, reports a rich discovery of copper in the department of Yoro. The discoverers have located eight well-defined veins; which can be traced for miles on the surface, two of these being 12 feet wide. The consul states that the properties are surrounded by forests of oak and pine, a coal deposit is within 20 miles, there is abundant water power sufficient for any machinery needed for reduction, etc., and that it is comparatively close to transportation—40 miles from the Ulua river, which is connected by canals with the bay at Puerto Cortes.

### MEXICO.

A decree has been issued by President Diaz to the effect that one or more parties may hold several mining claims by one title, for which they will pay only \$6 per portencia for the first twenty-five, and \$3 for every one thereafter; this is to be the case whether the claims are adjoining or otherwise. Also the decree covers persons holding claims under different titles, but adjoining, who may petition the government for the same charges.

#### Chihuahua.

Governor Creel has granted a concession for a reduction to J. F. Johnston of Parral, who says that his smelter will be of 500 tons capacity. The concession gives Mr. Johnston six months from the first official publication of the concession in which to begin work and eighteen months from the same date to complete it. The minimum capacity of the plant allowed is 200 tons daily and the minimum amount he can expend upon it is \$100,000. Mr. Johnston is allowed to select his smelter site in Jimenez, Parral or Allende. The concession carries with it the right to condemn lands for the site of the plant, the right to build dams for impounding water, etc., general exemption from all State and municipal taxes for fifteen years.

#### Durango.

The Guauacevi Exploration Co. has purchased the Rafael mining properties near Guanacevi, and will operate them.

To treat the ores of the Abra mine in the San Dimas district, the Haggin-Hearst interests, it is stated, will put in a 40-stamp reduction mill.

#### Guerrero.

The Trinidad mine, near Raton, in the Aldana district, after frequent experiments, has adopted a process which will successfully treat the ores which have been developed. B. Davidson is general manager.

#### Jalisco.

F. Valderrama has sold the Abaradon mine, in the Hostotipaquillo district, to Carlos Romero of Guadalajara for \$20,000. As soon as there are 50,000 tons of milling ore on the dump reduction works will be commenced.

H. M. Sunde is getting high-grade ore out of the San Jose de las Agujas mine on the Agujas mountain in the Navidad camp. A double-compartment shaft is down 135 feet, and there are 250 feet of drifts.—U. Johnson of Los Angeles, who has been prospecting for oil east of Zapotlan, is said to have struck a deposit of coal.

The San Antonio y Anexas mines in the municipality of Tapalpa have been sold to the Chatterton M. Co., who intend to spend \$100,000 in the purchase of machinery for the mines and in the erection of the reduction works. N. W. Kinross is manager.

#### Puebla.

The Cia. Minera de Mexico has started its 150-ton chlorination and cyanide plant at Tetales, under the direction of H. Cabrero, who states that the company has 80,000 tons of manganese ore, carrying gold, in sight, and that work of development is going on. R. H. Hutson is general manager and L. Chevrillon is chief engineer.

#### Sinaloa.

The bismuth mine in the Rosario district, owned by G. Petersen, has been purchased, it is reported, by O. L. Jones of Oklahoma City, Ok.

#### Sonora.

The Sonora Coal & Land Co. has been incorporated to acquire coal lands in the State of Sonora.

Superintendent E. W. Jones will start the Cerro Azul M. Co.'s gold mines, 15 miles east of Imuris.

In the Caliche region, on the Santo Domingo river, 3 miles from Cerro Prieto, Las Tres Naciones G. M. Co. have fifty men at work, and have sunk two shafts each 100 feet, and going yet deeper, with a tunnel 150 feet in length. The Calera mill has been leased and repaired to treat the ore. A. B. Oliver, consulting engineer for the company, will start work on a new 20-stamp mill, which will be built on the Santo Domingo river and connected with the mine by an aerial tramway. A. W. Morris is superintendent and F. J. Johnson is mill foreman.—T. M. Clancy at Cananea has put in a hoisting engine, a boiler and an air compressor.—H. C. Reno, manager for the Trinity M. Co., has taken over the Jojoha mine at Magdalena.

#### Zacatecas.

Statistics on the mineral production of the State of Zacatecas during 1904 show that the total value of the mineral produced in the twelve months was \$6,684,463.07. Of this amount the ore shipped out of the State for treatment elsewhere represented a value of \$5,409,406.27 and that treated in the State had a value of \$1,275,056.80. Only gold and silver were treated in the State, all copper and lead produced being sent out of Zacatecas for treatment. The values of the different minerals were as follows: Silver, \$5,709,858.76; gold, \$581,281.87; copper, \$269,421.36; lead, \$123,901.08.—At the Mezquital gold mines at Mezquital del Oro remodeling the 50-stamp mill has been completed and a new steam hoist is being put in. The cyaniding plant at the mines is to be enlarged. M. Cockerell is manager.

### Trade Treatises.

The Hydro-Carbon Mfg. Co. of Denver, Colo., describe the uses of "Elatecote Coatings" for preserving metal and wood from heat, acid and atmospheric agencies in a neat booklet which includes copies of a number of letters received from users.

The Quincy Corliss and vertical engines are described in Bulletins 104 and 103, respectively, issued by the Quincy Engine Works, Quincy, Ill., represented on the Pacific coast by the California Hydraulic Engineering & Supply Co., 17-19 Fremont street, San Francisco, Cal.

"Far Down Beneath the Upper World" is the title of an unusually fine folder from the Watt Mining Car

Wheel Co., Barnesville, Ohio. It is for mine operators and artistically portrays the workings of a number of large mines in different parts of the Union. Each mine so noticed has a page to itself and the idea is finely worked out. There are a few figures of coal production, a graceful word of preface, and the rest is all pictures, the whole constituting a fine advertisement of the Watt Mining Car Wheel Co.

### Personal.

C. D. LANE has gone from San Francisco, Cal., to Nome, Alaska.

E. L. DOBBE has returned to Salt Lake City, Utah, from a California visit.

C. E. FINNEY has charge of construction of the smelter at Val Verde, Ariz.

N. C. BONNEVILLE, Denver, Colo., has returned there from Salt Lake City, Utah.

C. A. BEATTY is examining the Utah Copper Co.'s holdings at Bingham, Utah.

F. E. MARCY with Allis-Chalmers Co., Chicago, Ill., was in Denver, Colo., last week.

N. C. BANKS, Magdalena, Sonora, Mexico, is manager Black Mountain G. M. Co.

JAS. RULE of Nevadaville, Colo., has been appointed manager Roderick Dhu G. M. Co.

S. GOOD has been appointed manager La Luz M. Co. at Cusburiachie, Sonora, Mexico.

H. J. B. BAIRD has been appointed manager Goldfield Great Bend mine at Goldfield, Nev.

T. H. TRACY, of the Power & Mining Machinery Co. of New York, is visiting California.

J. L. GRIMES is superintendent of the Black Canyon mine at Westville, Placer county, Cal.

ALEX. ROSSI has charge of the Graham mines in the Copper City region, near Redding, Cal.

W. JAMES of London, Eng., has been in San Francisco and examining mines in California.

N. E. HECKELTHORN has returned to Warren, Idaho, from Florida and will develop his mines.

WM. C. EAKINS has returned to Arlington, N. J., from San Francisco, Cal., via Goldfield, Nev.

L. W. TRUMBULL has accepted a position as consulting engineer Strong Copper M. Co. at Leslie, Wyo.

A. M. PLUM has returned from Alabama to Lewistown, Mont., where he is looking after his mining interests.

J. A. INGALLS has been appointed superintendent of the Majestic copper mine at Milford, Beaver county, Utah.

GEORGE OSWELL has been appointed superintendent Highland mine, near Sumpter, Or., vice O. Herlocker, resigned.

CHARLES KAMMERER has been appointed superintendent of the dredgers of the Conrey M. Co. at Ruby, Montana.

H. F. POOL has charge of work at the West Notaway mine in the Russell district, near Central City, Gilpin county, Colo.

L. W. BONNEY, who has been operating mines in the Magdalena district, Sonora, Mexico, will be in Seattle, Wash., until fall.

W. SKEWES has resigned as manager Challenge property of the St. Mary's Mineral, Land & Canal Co. at Houghton, Mich.

C. C. CHAPPELL, manager Denver office Westinghouse Machine Co., has returned to Denver, Colo., from Salt Lake City, Utah.

H. W. MORSE, for three years past the assistant manager of the Morning mine, at Mullan, Idaho, has been appointed general manager.

F. M. CLARK has resigned as assistant superintendent South Eureka mine, Sutter-Creek, Cal., to go to a mining property at Bullfrog, Nev.

C. W. PHILIPS is manager Las Tres Naciones G. M. Co. working on the Santa Domingo river, 3 miles from Cerro Prieto, Sonora, Mexico.

H. VINCENT WALLACE has severed his connection with Vela Grande Co., Altar, Mexico, and is now with Roy & Titcomb, Nogales, Ariz.

J. M. MCSHANE, representing the Broderick & Bascom Rope Co., has returned to St. Louis, Mo., from a general tour of the Pacific coast.

S. BOWERS of Los Angeles, Cal., has been examining the saline deposits of Danby lake, 25 miles southeast of Danby, San Bernardino county, Cal.

R. MCF. DOBLE, consulting engineer of the Abner Doble Co., San Francisco, Cal., is in Mexico investigating hydro-electric long-distance power projects.

R. B. LAMB has resigned the management of the Great Tower Hill gold mines, Lenora, West Australia, to return to the United States on mining business.

B. W. VALLAT has resigned as mining engineer for the Bay State Iron Co. at Virginia, Minn., to become engineer for the Colorado Fuel & Iron Co. at Sunrise, Wyo.

GEORGE ALEXANDER has been appointed manager of the Ferguson mines, Ltd., at Ferguson, near Five Mile, Trout Lake mining district, which controls the Nettle L., Silver Cup and other mines.



## Books Received.

The United States Geological Survey has issued the "Silverton Folio," No. 120, giving descriptive text, topographic map, areal geology map, economic geology map, structure section sheet, columnar section sheet and illustration sheet of Silverton, Colo.

"Annual Report of the Minister of Mines" for the year ending Dec. 31, 1904, gives an account of mining operations for gold, coal, etc., in the province of British Columbia. In addition to the usual information regarding mining operations, the volume contains drawings graphically illustrating the metallurgical processes at different plants, tracing from the raw material to the finished product.

The complex methods of gas analysis are collected and simplified and their application explained in "The Investigation of Mine Air," by C. L. N. Foster and J. S. Hal-dane. The book gives an account by several authors of the nature, significance and practical methods of measurement of the impurities in the air of coal and metal mines. The first part is a translation of O. Brunck's "Simple Methods of Mine Air Analysis." The second part is a description of methods used in the measurement of air currents and fire damp at the Ronchamp collieries, by L. Poussigue. The third part contains an account of rapid methods of air analysis, by J. S. Hal-dane. The appendix graphically describes the effects of carbonic acid, by C. L. N. Foster. The methods presented are comparatively simple and may be performed rapidly. The life of the miner depends upon the care taken in ventilation, and whatever advances knowledge on this subject should be studied by the mining engineer. The methods described are mainly with reference to gases escaping from the ground and not the result of blasting or respiration which seem to be subsidiary in coal mining. It is published by J. B. Lippincott Co., Philadelphia, Pa.

Experience is man's best teacher, but young engineers are often called upon to superintend work about which they know but little. To such, "Earth and Rock Excavation," by Charles Prelini, will contain much valuable information. The planning and execution of work involving excavation and the means employed in such work are the author's subjects. He begins with a discussion of the graphical representation and calculation of earth work, describing the methods of marked points, of contour lines and of profile and cross sections. This part of the subject is often overlooked by American engineers, and in his endeavor to impress its importance the author devotes considerable space to theoretical and mathematical discussion. Then follow chapters describing the construction and operation of machines used in excavating and transporting earth and rock, including various blasting agents. This section of the book seems somewhat verbose and is far from being complete, yet many of the various types of cutting and conveying machinery are illustrated and can be supplemented by catalogues of different machinery houses. The succeeding chapters on methods of planning and executing works of excavation constitute the most valuable part of the book. The author hits the keynote of successful work when he lays emphasis on the importance of the handling and care of the men doing the work. The practical man will be amused by the usual theoretical statements of foot pounds of work performed by ideal men working continually, but will profit by some really practical hints on pushing work. The book is concluded by statistical description of large works of excavation. The chief fault to be found in the book is the lack of detail as to costs. Engineers are everywhere looking for statements of costs under all conditions and a record of these often forms the most valuable part of their experience. The book makes no attempt to deal with underground problems, and will be of value mainly to railway contractors, ditch excavators and building constructors, although some space is also devoted to quarrying. In reviewing, undue prominence may have been given to a discussion of the shortcomings, for the book is an excellent step in the direction of systematizing engineering data. It is published by D. Van Nostrand Co., 23 Murray street, New York, for \$3, and will be sent postpaid by the MINING AND SCIENTIFIC PRESS upon receipt of price.

## Commercial Paragraphs.

THE Miners' Assay Office, John Harrigan proprietor, has been moved from No. 19 to 25 Stevenson street, San Francisco, Cal.

THE Wagner Electric Mfg. Co. has opened an office at 417 Rialto Bldg., San Francisco, Cal., with A. J. Myers in charge as district manager.

THE Vulcan Iron Works Co. of Toledo, Ohio, have shipped one of their Little Giant steam shovels to the Northern Mines Co., Ltd., of Atlin, B. C., for placer work.

THE San Francisco office of the Allis-Chalmers Co. is moved from the Kohl Bldg. to the ground floor, Rialto Bldg., Cor. Mission and New Montgomery streets, San Francisco.

THE Power & Mining Machinery Co. of Cudahy, Wis., and 52 William street, New York, has established a branch office at 215 Commercial Club Bldg., Salt Lake City, Utah, with Geo. F. Waddell as district manager.

T. L. KNUDSON, who has been in the mining machinery business for twenty-five years, has formed a company under the name of Knudson-MacDonald Co., with offices at 414 Stock Exchange Building, Chicago. They will handle a general line of mining and cement machinery, including crushing, grinding, pulverizing

and air separating machines, and will also act as consulting engineers.

THE S. H. Supply Co., of Denver, are furnishing three complete air compressing plants with American compressors, for which they are Western agents, one going to the Ohio-Mexican M. Co. in Arizona and two to Colorado. This company is also furnishing a No. 2 Wild mill to Idaho and two Wild shaking screens to Old Mexico.

COLORADO IRON WORKS COMPANY of Denver, Colo., report the following shipments: To the Great Western Sugar Co., at Fort Collins, Colorado, two 11x15-inch Dodge crushers and one set of 20x12-inch Compromise rolls; to the same company at Loveland, Colorado, two 11x15-inch Dodge crushers, one set of 20x12-inch Compromise rolls and three carloads of steel tanks and fittings; to the Denver City Tramway Co., one impact screen, one 11x15-inch Dodge crusher and one 60-foot belt elevator and equipment; one impact screen to the School of Mines, Kingston, Ontario, Canada; one set of 27x14-inch improved standard crushing rolls to the Mazapil Copper Co., in Mexico; two impact screens to the H. & B. Mining Co. in Colorado; five carloads of sheet steel dust flues, etc., for the Bingham smelter at Bingham, Utah; two sets of 27x14-inch H. rolls to the Success Mining Co. in Montana; one 32-foot Oxland roaster, dryer and equipment for the Julian Mining Co. in California; concentrating equipments for the El Cobre Copper Co. in Cuba; four all-iron Perfect pattern ore feeders for the Lone Star Mining Co. in Nicaragua, C. A.

## Obituary.

J. S. ICKIS, one of the owners of the Barranca del Oro mine in Tepic, died at Guadalajara, aged 38.

D. W. GILLISON, engineer for the Tonopah Water Co., was killed by being caught in the pumping machinery at Rye Patch, Nev., on May 31.

FRANCIS HEURTEVANT, a mine owner of Trinity county, was shot and killed May 25 on the banks of Trinity river, 4 miles below Junction City, Cal., by an unknown man. He owned the Red Hill mine.

JAMES CROSS, a California mine operator and manager, who for years has been identified with the Hayward and Hohart interests in Nevada and California, died at his home in Stockton, Cal., May 31, aged 65 years.

## Latest Market Reports.

SAN FRANCISCO, May 31, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 58½c, refined (1000 fine); San Francisco, 58½c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, \$15.00; Lake, 1 to 3 casks, \$15.00@15.00; Electrolytic, 1 to 3 casks, \$15.00; Casting, 1 to 3 casks, \$14.75@14.75. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £65 3s 9d spot per ton.

During the week there has been no material change in the copper market either at home or abroad. Prices are about the same, with no unusual features to distinguish the market. There has been a slight falling off in price the past month—the fraction of a cent—but for the present, unless something unforeseen occurs, the price is not likely to advance. The temporary closing down of the United Verde mine at Jerome, Ariz., will possibly effect the supply on hand eventually, but this will probably not be noticed within sixty days, if at all. There are always these irregularities in the market. Producing mines are closed temporarily, new mines are opened and other changes are constantly taking place, but the output shows about the same tendency throughout, with a steadily increasing production to meet the increasing demand.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots, 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 17s 6d per long ton.

SPELTER.—New York, \$5.50; St. Louis, \$5.70; London, £23 12s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.85@30.20; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 35@37½c. London, £136 5s.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$38.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c. SOLDIER.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

ZINC.—Metallic, chemically pure, 50c; dust, 40c; 10c; sulphate, 10c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c. ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs. 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.25@16.25; gray forge, \$16.00; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer hillets, Pittsburgh, \$23.00@25.00; open hearth hillets, \$23.00@25.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c;

in 25-lb. tin pails, 1c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price. Dry Lead.—In hbls., 1 ton and over, 6½c; do. in kegs, 7c. LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl. CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallsend, \$7.50; Brynmor, \$7.50; Pennsylvania, h.d., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. O. B. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chloride of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2½c; powdered sulphur, 2½@2½c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linsed, boiled, hbl., 62c; cs., 67c; raw, hbl., 60c; cs., 65c; Lucol oil, boiled, hbl., 54c; cs., 59c; raw, hbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 18c; As; tral, 18c; Star, 18c; Extra Star, 21c; Ecocene, 20c; Elaine, 26c; Water White, in bulk, 11½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, hbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 53@68c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, 7½c per lb., 80c.

PHOSPHORUS.—American, 70c per lb., 70c.

SODIUM.—Metal, 50c per lb., 50c.

BISMUTH.—Subnitrate, 7½c per lb., \$2.10.

SILVER.—Chloride, 7½c per oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, 7½c per lb.; less than 500 lbs., 7c.

MANGANESE.—Black oxide, 7½c per lb., 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewhaek, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, 7½c per ton 2000 lbs. in 125-lb. hags, double, and dry ground, f. o. b., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 23, 1905.

790,863.—FURNACE—J. H. Anderson, Los Angeles, Cal.  
790,864.—FURNACE—J. H. Anderson, Los Angeles, Cal.  
790,474.—FOLDING BED—J. C. Bahr, S. F.  
790,422.—OIL BURNER—G. S. Bennett, S. F.  
790,777.—FURNACE—W. N. Best, Los Angeles, Cal.  
790,613.—AMUSEMENT DEVICE—J. C. Boyle, Portland, Or.  
790,345.—LAMP SHADE SUPPORT—F. N. Cooley, S. F.  
790,280.—CAMERA—J. S. Ditty, S. F.  
790,552.—WATER ELEVATOR—V. A. Douglas, Anacortes, Wash.  
790,553.—IRRIGATOR—E. S. Estlin, S. F.  
790,556.—ROTARY ENGINE—A. F. Ford, Colfax, Wash.  
790,823.—BORING MACHINE—J. M. Garfield, Los Angeles, Cal.  
790,825.—FURNACE—C. R. Glafke, Los Angeles, Cal.  
790,832.—WINDOW SHADE—M. L. Hansen, S. F.  
790,684.—TELEPHONE CALL—Harveston & Mudgett, S. F.  
790,734.—OIL BURNER—P. H. W. Harvey, Los Angeles, Cal.  
790,432.—TOOL—C. L. Heilrich, Sacramento, Cal.  
790,337.—FRUIT BAG—F. L. Hepler, Covina, Cal.  
790,634.—FURNACE JOINT—O. H. Hicks, Riverside, Cal.  
790,636.—STUMP BURNER—C. N. Hubbard, Bee, Wash.  
790,630.—WASHING MACHINE—P. P. Kiehl, Oakland, Cal.  
790,580.—PRUNE DIPPER—C. J. Kurtz, Salem, Or.  
790,734.—OIL BURNER—P. H. W. Harvey, Los Angeles, Cal.  
790,532.—LOOSE LEAF BINDER—G. McBride, Golden Gate, Cal.  
790,651.—FLY TRAP—J. McConnell, Raine, Wash.  
790,653.—DOOR SECURER—H. Nottthoff, Santa Monica, Cal.  
790,703.—WINDOW SHADE ADJUSTER—W. C. Organ, Oakland, Cal.  
790,403.—OILING ROADS—I. E. Smith, Sacramento, Cal.  
790,710.—HORSE RELEASER—A. P. Weeks, Santa Cruz, Cal.  
790,775.—STAPLE SETTER—F. Wiseman, John Day, Or.  
790,415.—ANALCAMATOR—O. W. Zane, Los Angeles, Cal.



# MINING AND SCIENTIFIC PRESS

Whole No. 2342.— VOLUME XC.  
Number 23.

SAN FRANCISCO, CAL., SATURDAY, JUNE 10, 1905.

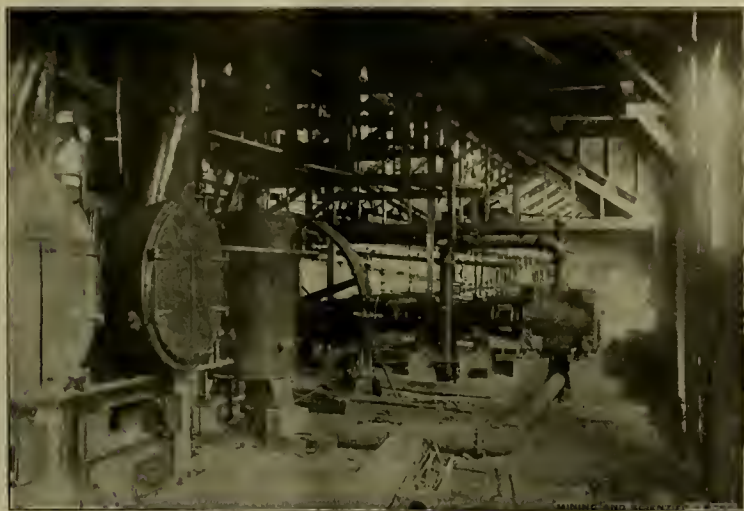
THREE DOLLARS PER ANNUM.  
Single Copies, Ten Cents.

## Great Mills in Alaska.

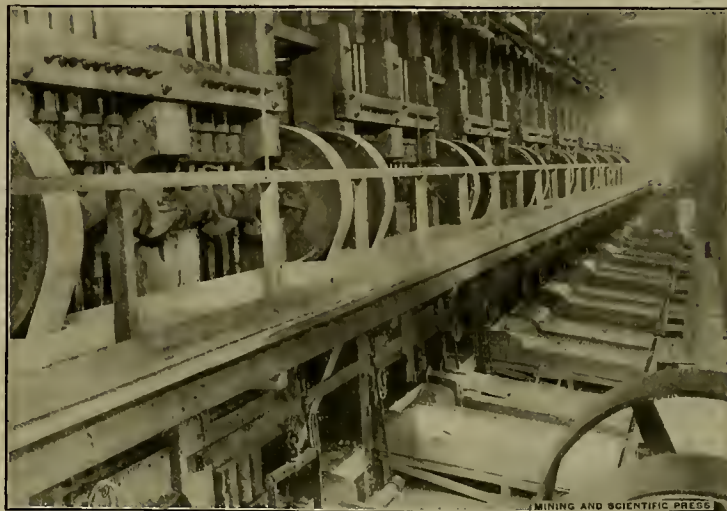
In the earlier history of mining on Douglas Island, Alaska, the mill of the Alaska-Treadwell mine was comparatively small, and when the proposition to increase the number of stamps was made, the matter was seriously considered for some time before it was finally determined to take the risk which such investment involved. It was argued by those in

favor of a larger mill, that the greatly increased capacity would result in lowering the cost of milling, as it had already been determined that there was abundance of ore available, and it was finally determined to enlarge the mill to 240 stamps. The venture at once proved a success, and the profit per ton of ore crushed was increased. Since then the number of stamps has been increased several times. Profiting by the past experience of the Alaska-

Treadwell Co., the Alaska Perseverance Co., operating near Juneau, will begin the construction of a 300-stamp mill. The great ore deposits of Douglas Island have been shown to be well adapted to the great mills built on them, but these mills are thus far the result of the gradual development of the mines, and the proof of the ability of the mines to keep the stamps constantly supplied with a payable grade of ore.



Power Plant of Taracol Eighty-Stamp Mill, Korea. (See Page 370.)



Eighty-Stamp Mill at Taracol Mine, Korea. (See Page 370.)



Natives Employed as Carpenters at Korean Mines. (See Page 370.)



Cows as Pack Animals in Korea. (See Page 370.)



A Korean Native and Bull Cart. (See Page 370.)



The Eighty-Stamp Mill at Taracol, Korea—Constructive Stage. (See Page 370.)



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## The Copper Situation.

The consumption of copper has been increasing from year to year during the past decade, there being but a single year when the consumption of the metal did not exceed that of the previous year. This was during 1901. The amount of copper required in the industries in 1893 was 268,447 tons. In 1903, ten years later, it was nearly double this amount, having been 520,944 tons. In 1904 the consumption was further increased to 557,805 tons, nearly 36,000 tons more than in 1903. If the past decade can be considered as a criterion for the future, it seems unlikely that the copper production of the world will be more than temporarily increased beyond the demand. It should be remembered that those mines which are most easily accessible and which afford the greatest immediate profit are being worked vigorously, and are gradually being exhausted—and can never reproduce the metal now being taken out. New discoveries, the reopening of old mines and the enlarging of existing plants are the sources of increase in copper production, but these new mines barely compensate for the rapid exhaustion of the greater properties. Copper occurs in a great many States of the Union, and nearly every country has more or less copper, but it is always a question of economics—will it pay? In most cases the career of an unprofitable mine is short, and it waits until conditions change to an extent that makes profitable operation possible. Usually the transportation problem is the most serious consideration. Then, some mines can be profitably worked with copper at 15 cents or over, which can make nothing at 12 cents or less. Such mines are active or idle, according to the market, and there are many such. At present the copper industry is in prosperous condition, and there is no reason

to anticipate either lower prices or a less demand for the metal. If the present indications—that standard steam railroads are to be equipped with electricity—becomes a fact, the demand for copper will be greatly stimulated, possibly to such an extent as to materially influence the extensive use of aluminum as a conductor.

## Rock Nomenclature.

Elsewhere herein will be found an abstract of the revised ideas of J. E. Spurr of the United States Geological Survey as to the geology of Tonopah district, Nevada. So much interest centers around these new camps of southern Nevada that this latest contribution on the structural and economic geology of so important a district will be gladly received, whether the reader agrees with Mr. Spurr or not. That eminent geologist has the courage of his convictions, at least, and does not hesitate to "coin" a name to suit conditions as he sees them, if no name has already been provided. His "alaskite" is evidence of this tendency. In Alaska Mr. Spurr found numerous aplite dikes which had become silicified, or it may be that the unusually abundant silica in these granitic dikes was original in the magma. To these dikes he gave the name "alaskite," and the name seems to stick. In his geology of Tonopah he has added a new rock to the long list of names in rock nomenclature in "rhyolite-dacite." All students of petrography are familiar with rhyolite and understand what is meant, and all are equally acquainted with dacite (quartz-andesite) and appreciate its significance, but rhyolite-dacite is a refinement of rock classification not recognized by Rosenbusch, Zirkel, Williams, Kemp or any other authority with which we are familiar. Mr. Spurr does not explain in his contribution what is meant by rhyolite-dacite. It may mean a rhyolite in which there is sufficient andesine to incline it toward the andesites, or it may be a typical quartz-andesite (dacite) in which the occurrence of abundant sanidine and a fluidal structure would suggest rhyolite. All petrographers know that the lines of demarkation between rocks are not sharply drawn, but it seems unnecessary to create new names where none are required. It does not appear as essential to the value of the mines that any particular kind of rock be present, yet it is very important that the miners be informed as to the relative age of the various rocks of the district, and in which their veins are situated, for undoubtedly there is more significance in structural conditions than in the character of the rock. Complications should be avoided, as far as possible. Andesite and rhyolite are plain and conventional terms the meaning of which is appreciated, and the prefix "earlier," or "later," will be given due consideration, being self-explanatory, but rhyolite-dacite is perplexing and no one knows what is intended.

## Head Frame Design.

Economy in the construction of head frames is always an interesting and important matter with mining engineers. For many years the practice of building massive four-post frames, with their heavy and expensive back braces and interior angle bracing, has been common. There has been nothing in particular to recommend such structures, aside from the fact that it has been the customary form of pit-head design for many years. These structures are solid, heavy and undoubtedly safe—the factor for safety often being ten to twenty times greater than the most conservative engineer would require. As a result these frames are unnecessarily expensive. Some years ago a different type of frame was introduced—the two-post frame with back braces. This type is often called the Montana frame, from the fact that it was in Montana that it was first extensively employed, though now largely in use throughout the West. The two-post frame is inexpensive, requires far less material than the four-post frame of the same height and is easily constructed, there being few perplexing angles to worry the non-technical mine carpenter. There is, however, a better and more desirable type of head frame construction than either the four-post or the ordinary two-post frame. Elsewhere herein will be found a descriptive, illustrated contribution by a well-known engineer, in which the most advanced type of modern steel head

frame construction is discussed. Here three kinds of frames are shown. The first is the steel frame erected over the shaft of Plant's Day Dawn mine in Charters Towers district, Queensland, Australia. This frame shows the painstaking engineering work that has been put on it, and, if designed to support a large water tank, could scarcely be improved upon. The frame is substantial and makes a handsome appearance, but contains sufficient material to almost build two frames, which would answer every purpose to which the present construction can be applied. On the page opposite to this illustration is the steel frame at the High Ore mine at Butte, Mont. This frame is approaching the advanced modern ideas described and illustrated by the sketches at the bottom of page 374. Without doubt this modern type of frame will, in time, come to be recognized as among the most desirable because tending toward the minimum of expense, and as fulfilling every requirement.

## Deterioration of Hoisting Ropes.

In a recent technical article discussing wire hoisting ropes the writers of the paper attribute the deterioration of winding ropes chiefly to decrease in sectional area, caused by frictional wear of the wires upon each other, or to corrosion; to "fatigue," or a change in the state of the steel from which the rope is made, and to discontinuity of the wires, due to breaking. The frictional wear of a rope is a natural consequence of its use, for no matter how frequently and carefully a winding rope may be greased, there is always a slight movement within the rope when running, particularly as it bends over the sheaves, and upon the drum of the hoist. Any object with which the rope comes in contact must cause abrasion, if ever so slight. The working of the wires upon each other and the wear induced by the winding of the rope upon the drum upon coils of rope already wound are probably the most important causes of wear, particularly the latter. Careful inspection of a rope used in this manner will show this to be so. An examination will usually discover broken wires, and should they become numerous the rope should be abandoned. It is generally recognized that hoisting ropes are subjected to deterioration in a number of ways, but ordinarily nothing in particular is done to prevent it, except to again "oil the rope," after contemplation of the discovery that the rope shows signs of wear.

No rope will last forever, and a rope in constant use should be renewed as often as it shows evidence of material deterioration. The wear on the rope can be reduced by care in alignment, by the installation of sheaves and hoist drums of liberal size to reduce bending strains and consequent wear, and to avoid contact of the rope with a greater number of sheaves and idlers than is absolutely necessary. The hoisting engine should be started and stopped with care, and not with a sudden jerk, as is too often done. It is almost as bad to stop suddenly as to start suddenly when hoisting. There are in many instances too little attention and care given to hoisting ropes, but much can be done in the beginning by putting in a proper installation, in which the relative size of sheaves and winding drums to the diameter of the rope is given the proper consideration, and this is one of the most important matters in the life of a winding rope. Proper alignment is probably the next important factor.

**A**LCHEMY is as old as civilization. In all civilized ages there have been men who made claim to having discovered the secret of the transmutation of silver into gold with as much seriousness and apparent truthfulness as that now assumed by an alleged scientist in Philadelphia, who says he is making extensive preparations to manufacture gold from silver, but he, like his predecessors, will have to give some tangible evidence of his ability to perform this wonderful feat of chemical legerdemain. Those interested in this newest phase of occult science will remember that Philadelphia was for 25 years the home of the Keeley motor, in which its fakir inventor succeeded in interesting some of the leading financiers of his day, but which eventually proved to be merely a trick so simple in its operation as to be laughable, and yet Keeley deceived his backers and held their confidence and money to the day of his death.



## CONCENTRATES.

THE stack of the Tacoma, Wash., smelter is built of concrete and is 307 feet high.

ELATERITE is a wax-like hydro-carbon mined near Fort Duchesne, Utah. It is used in making paint and waterproof material for roofs, walls, etc.

THE manufacturers of diamond drills state that their machines can be successfully operated by means of the gasoline engine, the possibilities depending on the power of the engine.

THE presence of sand in crude petroleum can be at once detected by pouring some of the oil on a clean glass plate when every grain large enough to be visible can be seen at a glance.

DYNAMITE is any mixture of nitroglycerine with an absorbent, such as wood pulp, sawdust, infusorial earth, etc., so as to form a solid substance that may be readily handled with comparative safety.

THE creation of a forest reserve does not withdraw the tract from entry by the prospector. Mines may be sought, developed, equipped and worked in a forest reserve the same as in any other part of the public domain.

AN ore carrying a very high percentage of sulphurets may be concentrated without difficulty if a sufficient number of machines be provided to properly accomplish the work. No concentrator works well with an overload.

THE metal tantalum is now being used in making filaments for incandescent electric lamps. The weight of the filament is 22 milligrams. It is claimed that it produces a light equal to carbon filaments with half the current.

THE first shaft sunk on the Tamarack copper mine, near the Calumet & Hecla, in the Lake Superior, Mich., region, cut the lode at a depth of 2300 feet. The shaft cost \$200,000. It has since been sunk to a depth of about 3200 feet.

THE flow of water from a tank through a pipe may be increased without enlarging the tank by placing a bell-shaped piece on the end of the pipe entering the tank. This decreases the frictional resistance at the point of entry of the water.

THE Supreme Court of California has decided (case of Cameron v. Burnham, Sec. 1439) that in a mining partnership all parties to the agreement must live up to its conditions, and, failing in this, those who do not perform their part of the contract have no equity in the result.

A DISTINCTION is usually made between a settling tank and a classifier. The former is filled by the heavier material settling in the tank, the slimes overflowing. The classifier operates continuously, the coarser material passing out at the bottom and the fine overflowing at the top.

IT is unsafe to enter any disused mine shaft or other working without first testing the air by means of a lighted candle. Carbonic acid gas may fill the workings and be at first unnoticed. When the percentage of this deadly gas is large enough it is very prompt in its effect on men and animals.

IN drilling oil or other wells, the top of which must be beneath the water, it is customary to sink a casing larger than that required for the drill hole, and forcing it down into the bedrock as far as possible, shutting out the surface water. The drilling is then proceeded with in the usual manner.

AIR does not become liquid by reason of pressure, no matter how great, until the critical temperature is reached. The compression of air always generates heat, but heat passes away by radiation. It is stated that air may be compressed as a gas until it is more dense than it is in the liquid state.

THERE is no book devoted wholly to the wet concentration of copper ores, although there is a large amount of literature on this subject, scattered through many books and in the transactions of various scientific societies. This branch of metallurgy comes under the general head of ore dressing, or concentration.

WHERE it is desired to build the roof of a furnace, or an arch of any kind, and lumber for false work is scarce or unobtainable, the form may be built under some circumstances by piling up rocks, sticks and earth in the proper shape and building on this. When completed the waste material of this improvised form may be removed.

A BARREL of crude petroleum contains 42 United States gallons. Seven barrels of oil weigh 2240 pounds. The heat units developed by crude California oil range from about 26,000 to 28,000 heat units per pound of oil. In burning oil little or no soot is deposited on the heat-

ing surface of the boiler, and the "efficiency" of the heat is high.

IN the excavation of limestone and shale in the shafts sunk at Niagara Falls, for power purposes, the cost of such work is stated to have been about \$3.50 per cubic yard. The pit sunk for the Canadian Niagara Power Co. is 570 feet long, 17.75 feet wide and 162 feet deep—a total of 60,636 cubic yards. The cost of this excavation was \$212,226.

WATER is freed from crude petroleum of low B. gravity by the addition of naphtha, which, making the oil more fluid, allows the water to settle to the bottom. This is done in laboratories in testing oils. In making this test the oil is kept at a temperature of about 100° F. for twenty-four hours, which facilitates the separation of water and sand from the oil.

ALL dry placer diggings originate from the degradation or erosion of veins and ore deposits containing the gold. A good payable placer district is not always a safe indication of a payable quartz district, for the reason that the gold in the rocks may occur in small seams and be so scattered as to make vein mining unprofitable, while the concentration of this scattered gold in a channel makes a rich pay streak.

GLYCERINE is sometimes used advantageously to prevent the formation of incrustations in steam boilers. Glycerine is said to increase the solubility of the various combinations of calcium, particularly the sulphate. When the amount of lime present becomes greater than can be held in solution it forms a gelatine composition, but this does not adhere to the boiler, and is not carried by the steam into the cylinders of the engine.

A NEW method of saving wooden poles has been developed in the construction of the new electricity works at Zurich, Switzerland, where ordinary telegraph poles are surrounded by sheets of wire netting and held a short space away from the wood by iron brackets. These in turn are covered with cement mortar 1½ to 2 inches thick. Poles of this kind are claimed to be cheaper than iron poles, and to be equally as durable.

SOME ores consist of both soft and hard material. If the values present greatly predominate in either character of ore, it may be treated by rather coarse crushing in rolls and the screening out of the soft material, which in a dry ore would be fine. Then either class containing the highest values may be selected for special treatment, the remainder being treated by some other method or discarded as waste. At Cripple Creek, Colo., something similar is done by washing and screening out the fines as they came from the mines.

WHEN a hoisting rope is to be replaced by another of either larger or smaller cross section, the sheave and idlers, if there are any, should be turned out, in order that any grooves worn by the former rope may not cut the new. Sometimes these grooves are very pronounced, just fitting the strands of the rope causing them. These grooves will not correspond to the strands of a rope of either greater or less diameter than the one making them. This condition is particularly noticeable in small sheaves placed at heads in the shaft.

WHERE a claim has been properly located and the assessment work done thereon, as required by law, for two years, if the owner of the claim fails the fourth year to do the work, and other parties enter and do the work without being authorized, this work will not inure to the benefit of the stranger, who has no interest in the title. If the title is allowed to lapse by reason of non-performance of assessment, then a stranger may enter and relocate the claim, and if the latter complies with the requirements of the law may hold the claim as against the original locator.

AURIFEROUS pyrite may be successfully concentrated by smelting in reverberatory furnaces, the gold being collected in copper "bottoms." This is the process generally employed at Swansea. In this process the ore is first roasted to eliminate the sulphur and also arsenic and antimony, if they be present; smelting for coarse metal or matte, with the addition of oxidized ores; roasting the matte; smelting the roasted matte, with pure oxidized ores for white metal; roasting and smelting the white metal for blister copper; refining the blister copper.

SALT is made from the waters of Great Salt Lake, Utah, and the product refined by a continuous process. It is ground and fed into a revolving cylinder, 6 feet in diameter and 30 feet long. Inside this cylinder is a second fixed cylinder of iron 14 inches diameter, which is charged with superheated steam. An exhaust fan carries away the water vapor and fine dust of magnesium chloride from the heated salt between the outer and inner cylinders. By this process the greater part of the magnesium chloride is eliminated, but for pure salt for table and other refined uses this process has to be repeated two or three times.

WHERE a superintendent of a mine for a company locates mining claims in the unoccupied public domain for himself or for others, he can hold the same as against the company. The fact that he is employed as superintendent of a mine for a company does not deprive him of

his rights as a private citizen. He may locate for himself or for others, and may sell any location made for himself. The fact that he made the statement that the locations were made in the interest of the company will not bind him, unless the company can show an agreement with the superintendent that he is to locate claims for the company for some substantial consideration.

WHERE two pipes are screwed into the bottom of a tank, each pipe of the same diameter but one of the pipes much longer than the other, the larger amount of water will flow in a given time from the longer pipe, though the longer pipe will retard the flow somewhat by reason of the greater frictional resistance. The amount of water that will be discharged through a pipe entering a tank or reservoir is determined by the "total head," which means the vertical distance from the surface of the water to the point of discharge. In long pipes the friction head may be considerable, particularly in those of small diameter.

A LARGER amount of bromine was produced in 1904 than ever before, in the United States the quantity being 879,312 pounds. For a number of years the domestic output has fluctuated between 400,000 and 500,000 pounds; this has been obtained by concentrating the bromides in the brine from the process of salt manufacture. The custom is to treat the bittern with sulphuric acid (forming hydrobromic acid), and using as oxidizing agents either chlorate of potash or manganese dioxide. The producing States in their order of importance are Michigan, West Virginia, Ohio and Pennsylvania, which engage about thirteen operating companies.

TOURMALINE is of many colors—pink, green, bluish, black, lilac and other shades. It is usually translucent, often transparent. This mineral has some optical properties which are made use of in the examination of some minerals. For this purpose the tourmaline is cut into plates and mounted in a frame, forming what is known as a polariscope. The mineral to be studied is placed between these plates and examined for what are known as interference figures. Such devices are of little use to the inexperienced. Polariscopes are also made from sections of crystals of Iceland spar (calcite). They are used in connection with microscopes for the determination of minerals, in transparent thin plates.

THE United States Geological Survey was organized in 1879. Prior to that date there had been four extensive surveys, carried on under Hayden, King, Powell and Wheeler. These were respectively the "Geological and Geographical Survey of the Territories," "Geological Survey of the Fortieth Parallel," "Geographical and Geological Surveys of the Rocky Mountain Region," and "Geographical Surveys West of the One Hundredth Meridian." A catalogue and index of these several surveys has been issued by the United States Geological Survey as Bulletin 222, which is for gratuitous distribution, but none of the reports of the above-mentioned surveys are available for distribution.

TIDE LANDS, that is, the lands along bay shores and along the ocean between high and low tide, belong to the State, and mineral claims cannot be acquired by private ownership under any of the general laws providing for the disposal of public lands. A mining claim cannot be so located as to extend below the line of high tide. In Alaska permits were granted by the Secretary of War to miners to maintain structures in the water and to work the beach sands below the high tide line at Nome and elsewhere on the coast. Some oil claims have been located on the coast in southern California, notably at Summerland in Santa Barbara county. In these instances permission to bore oil wells was obtained from the Secretary of War. These lands are the property of the State of California, but the occupants of these lands have remained undisturbed by the State, the only authority that could dispossess them.

WHERE B outfits F and E to locate and prospect mining claims, where the outfitter fulfills his part of the agreement, when the prospectors locate a mine a co-tenancy at once arises, with its attendant rights and obligations. "Lindley on Mines" says: "While there is no element of trust existing between tenants in common of mining property who are partners only for the purposes of exploration, in cases of 'grubstake,' or prospecting contracts, where discoveries are made, the prospector may take no unfair advantage of his associate in dealing with property. If he does he will be held to account for the profits derived from his unfair practices. During the life of the contract either party may, of course, purchase mining claims from his own funds and at his own risk without enabling the other to participate in the purchase." If F in the case above mentioned locates in his own name or in the names of others, it does not relieve him of his legal responsibility to B, who shares equally with him, according to the terms of this contract in all, not in only a portion of the claims located. If F sells a partnership claim for \$5000, B has the right to demand and recover his half of this sum, and could without doubt recover that sum from F, even though he had attempted to place the money beyond the reach of B by giving it to his wife. The strangers who might possibly hold the claims bought from F unless B sued to recover them, for the reason that F had no right to sell his (B's) interest in the property.



## Amalgamating Gold Ores.

Written for the MINING AND SCIENTIFIC PRESS by  
ALGERNON DEL MAR.

The familiar concept that each individual ore must be treated as an individual problem is a fundamental principle of the metallurgy of gold. It is hardly possible to formulate an accurate generalization of the best system to be pursued on any particular ore, by a few simple tests, for in actual practice different modes of treatment may produce equally good results, but certain facts gained by hard experience may be of use to those not having had the time or opportunity of personal research, and who may be so placed that a few hints would be acceptable. The ideas set forth were obtained from Western experience, so may not be applicable to ores of other countries, and are not infallible, for there are, no doubt, others equally well or better qualified to express opinions on the subject, and if their experiences can be drawn forth the object of this article will have been accomplished. We are all interested in the successful operation of each individual mine and the interchange of ideas on such an important subject, as the recovery of gold from its ores will surely help along the good work.

The personal equation plays as important a part in gold milling as in other walks of life. A millman must be honest and sober; his work embraces a knowledge of the principal mechanical arts—mechanics, engineering and carpentry, and at least an elementary idea of chemical reactions—besides which he should be a man of judgment and resourceful.

Each amalgamator usually has his individual methods of accomplishing what he considers the best results from a given ore, generally obtained by long practice in the district where he has worked, or it may be a system acquired from other mines which having proved of sufficient richness to pay well have had the halo of success cast over all their operations. It would therefore be heresy for any one in that district to inaugurate any different method.

My personal contact with the fraternity of "quick slingers" is that this system is generally forced upon them by the management, which, often ignorant of the subject, will give a ready ear to the numerous "old amalgamators" with which every district is infected.

I have a case in mind where two directors of a company, both "green," were jointly managing a property. One happened to have had the benefit of the instruction of an old-time raw-copper plate amalgamator, while the other had evidently collided with another antiquity, but of somewhat different ideas. We were priding ourselves upon how well the plates looked, and thinking how all our hard work would be appreciated; but, alas! the blow came when, within an interval of five minutes, the two directors individually examined the plates, and, with wise looks and grave faces, one informed me that the plates were "too soft" and the other that they were "too hard." "Home, Sweet Home," sounded very pleasant about that time, and, as the expression goes, "I hit the road," leaving my brother millman to do the conjuring trick of pleasing the dual management.

We will take for granted that the sizes of the screen openings are those best suited to the particular ore, that quicksilver is fed into the mortar and that the plates have an inclination of 1½ inch to the foot, this being an average grade and one suited to most ores, and that the plates are the width of the mortar. The question is now what sort of plates to use and what system of amalgamation will give the best results.

First, as to raw-copper or electro-silver-plated plates, the underlying principle is this: Plates which catch an abundance of amalgam and are kept hard may be of raw copper, such as both chuck block and back plates inside, and lip and splash plate outside the mortar. The former must in all cases be kept hard, to prevent scouring, and the latter should be hard, except where the chemical constituents of the ore cause fouling or discoloration, when they may be kept stiff and dressed over whenever the battery plates are brushed up.

The reason the lip plate had best be left to harden, not sprinkling any "quick" on at any time, is that if so treated it is a splendid indication of how the inside plates are doing.

Raw copper plates, when in good condition, with a thick coating of amalgam give a satisfactory amalgamating surface, but have the disadvantage of locking up quite a bit of gold, do not allow of one to judge of how the ore is doing from day to day, and are not so efficient as silvered plates for catching fine gold.

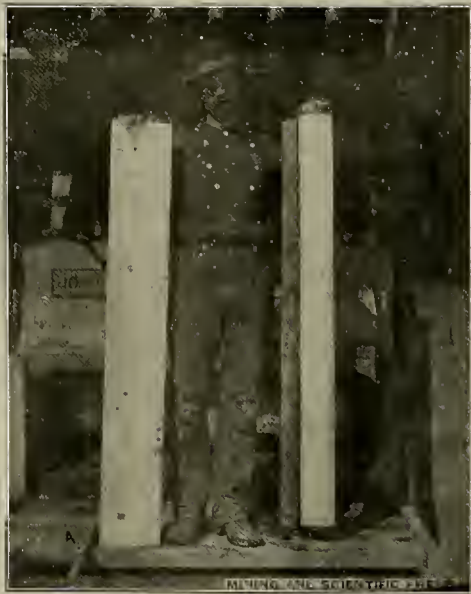
Silvered plates, on the whole, have the advantage of being better amalgamators than raw copper, can be cleaned off without seriously injuring the plate and are ready at once to begin their function as gold savers, and by the weight of amalgam taken off each day a close approximation of the value of the ore and the run up to date can be estimated.

Silver plates that have been badly treated, and have patches of copper exposed, can be temporarily kept in fair condition by a variety of chemicals, but

the only efficient method is to have the plates resilvered or a thick coating of amalgam kept over the spots. When amalgam is squeezed through canvas or buckskin in hot water it is thinned out and some very fine gold amalgam goes through the material. This fine amalgam will separate and settle on the bottom. The fine gold amalgam, if thoroughly rubbed into the desilverized spots, will form a nice smooth surface which, if kept sufficiently thick, will keep down the verdigris, and other spots which discolor the plates.

An old-timer imparted to my eager ear his method of treating silver plates. He said it never failed to cover up the bad spots. He used a mixture of spirits of salt (HCl) and nitric acid—or in other words, aqua regia—to dress the desilverized portions, and as long as the silver on the plates lasted the results were satisfactory, but the spots kept getting bigger and bigger, and when I saw them copper was evidently very cheap and silver at a big premium.

A good rule for dressing plates is to brush up with a stiff whisk broom whenever the upper 2 feet get fouled, and once a day under any circumstance. Some ores discolor plates so badly that every three hours the plates may require brushing over. On the other hand, other ores are remarkably free from objectionable constituents, but there is more or less grease coming from machine drills and other sources, so that it is best to hang up at least twice a day to go over the plates. After each dressing the amalgam should be smooth and evenly distributed, with no loose pieces on the plates. To prevent loss from such a source, the use of a cleanup box is recommended. This is a wooden box about 2 inches wide and 3 inches deep, which is as long as the width of the plates (43 to 54 inches). It is placed under the lip or edge of the last plate when dressing the plates or changing screens. Before dropping the stamps, if the plate is flushed off with the hose, all loose



Inside Plates of a Stamp Battery.

amalgam that would otherwise escape will be caught in this box. It is surprising the amount that may be saved by this simple expedient.

In connection with this subject, coarse gold will be considered as gold which, when amalgamated, offers some resistance to the current of pulp flowing over the plates, and fine gold as that which does not. Free gold ore is an ore in which the gold is free from chemical or mechanical combination, except with the gangue, from which it can be separated by crushing. A refractory ore is one in which the gold is either in chemical combination or is a mechanical mixture with bases or other minerals, such that these foreign substances have a deterrent effect upon the action of quicksilver.

The discharge of a stamp mill is the vertical distance between the top of the dies and the bottom of the screen opening, and not the screen area, as some think. We will consider below 4 inches a low discharge, above 7 inches a high discharge, and between 4 and 7 inches a medium discharge.

If we divide ores into "free and refractory" and "coarse and fine" as regards the gold particles, from the foregoing remarks we will try to form some generalizations, first explaining that by hard amalgam is meant that which cannot be rubbed up with a stiff brush, but requires the use of some hard instrument for its removal; stiff amalgam that which can be brushed up, but will not smooth out again except in lumps, and soft amalgam as between the last and that condition where the current of pulp will make an impression upon the amalgam gradually moving it toward the lower end of the plates, which state of fluidity should never be permitted to continue, if ever reached.

1. An ore in which the gold is free and coarse may have a low discharge, no inside plates, raw copper or

silvered battery plates; if the former, the upper portion of plate should be hard and lower portion stiff, and if the latter, the whole plate should be soft and the amalgam may be rubbed off every day, leaving a thin coating. If there is a lip plate, in both cases, it should be hard.

2. An ore in which the gold is free and fine will need a medium discharge, inside back plate not necessary, but a chuck block plate is advisable. The plates should be silvered and kept fairly soft. The plates should not be rubbed except on clean-up days, but brushed up with a whisk broom, the surplus amalgam taken off, leaving a good coating of amalgam as a ground work for future building up. The lip plate should be kept hard.

3. An ore in which the gold is refractory and coarse needs a medium to high discharge chuck block and back plates, silvered battery plates, which should be kept fairly soft, not rubbered, but all the coarse gold taken off with a brush, leaving a coating of amalgam. Lip plate kept hard.

4. An ore in which the gold is refractory and fine needs a high discharge, chuck block and back plates. The plates should be silvered and kept soft, the last 3 feet being rather stiff.

The amalgam should never be soft enough to move down the plates, nor should globules of mercury ("tears") be seen under any conditions. The plates should not be rubbered, but brushed up, the surplus amalgam taken off leaving a thick coating. Lip plates kept hard except where they foul easily when they are kept stiff, the scum or discoloration being taken off by lightly brushing over the surface.

The general conclusions are first raw copper should only be used for inside and lip plates, but may be used for battery plates when the gold is free and coarse. For all other conditions electroplated silver plates are preferred; second, no chemicals should be used on silvered plates unless absolutely necessary; third, silvered plates should never be allowed to get hard, while copper plates may; fourth, the more refractory the ore the higher the discharge; fifth, a coating of amalgam should always be left on the plates, and sixth, a millman must use care and judgment and not become a mere machine, following certain rules regardless of the condition of his plate. A fixed condition of the plates can only obtain when the character and value of the ore, the rate of crushing and the "silver" feed are constant and unvarying quantities.

## Reduction of Tin by Iron and Hydrochloric Acid.

In a paper contributed to the Washington State College, F. F. Flanders says:

The reduction of tin by iron and hydrochloric acid, with the subsequent addition of mercuric chloride, as a test for tin, is doubtless familiar to all analysts. The test, as commonly carried out, viz., allowing cold acid solution of tin and antimony to stand in contact with iron nails for three to four hours, filtering off the antimony and adding mercuric chloride to the filtrate, is open to serious objections. It was found in this laboratory that the test was sometimes given, even when no tin was present. This point has already been mentioned in literature (J. A. C. S. XXV., 876), and attributed to the action of certain compounds of carbon, formed from the carbon present in the iron nails usually employed.

The writer had occasion to investigate the test lately and found that by keeping the solution in contact with the nails at a boiling temperature for ten minutes a complete reduction was obtained and no action was produced on mercuric chloride in the absence of tin.

The modification is suggested both as a remedy for the trouble mentioned and as a time-saver.

## Uses for Bromine.

By far the larger part of the bromine produced, says the Chemical Engineer, is used by the manufacturing chemists, who market the bromides of potassium, sodium and ammonium among druggists and photographic supply houses. A small quantity of bromine is also used in the preparation of eosine (a phthalein coal-tar color), and also as a reagent (in a 10% solution of potassium bromide) for precipitating manganese from acetic solution, for the conversion of arsenious into arsenic acid, and for the detection of nickel in presence of cobalt in the potassium cyanide solution. Bromine dissolved in water makes an excellent disinfectant. Hope for expansion in consumption is centered in the larger use of bromination and bromocyanide processes of gold extraction, which are suggested as substitutes for chlorination and cyanidation.

BUILDINGS are now being constructed of reinforced concrete, ten stories in height. It is not positive that the building of structures of this magnitude from reinforced concrete has passed the experimental stage. Failures of concrete structures are generally traced to the use of too small a proportion of cement, for which sand has been substituted, being less expensive.



## Geology of Tonopah District, Nevada.

Ever since its discovery, Tonopah has been a district of more than ordinary interest. The unusual richness of its ores, the somewhat mysterious distribution of the ore shoots, as viewed by the non-scientific observer, and the peculiar geologic conditions existing there have all aided in making the Tonopah district attractive alike to the miner, the geologist and the capitalist. Last year was published a preliminary report on the geology of the district by the United States Geological Survey. The work was done by J. E. Spurr. At that time Mr. Spurr stated distinctly that it was only the result of a somewhat brief reconnaissance, and that the development of the mines of the district was insufficient to make the opinions as to the geological structure and conditions more than tentative. Within the past year Mr. Spurr has had an opportunity to again visit the Tonopah district, and as a result he has made some radical changes in his opinion of the geology of the region as related to the ore deposits. The latest report is embodied in Bulletin 260 of the United States Geological Survey entitled "Contributions to Economic Geology in 1904." The title of Mr. Spurr's new paper is "Development at Tonopah, Nev., During 1904." In part this latest addition to our knowledge of the Tonopah district is as follows:

Until recently there have been practically only three producing mines in the Tonopah district, although a number of others have shipped small quantities of ore. These producers have been the consolidated Mizpah and Valley View mines (Tonopah M. Co.), the Montana-Tonopah, near by, and the Belmont Co., whose properties are operated through the Desert Queen shaft. Recently, however, another mine, which ranks with those above mentioned, has been discovered and developed—the Tonopah Extension—and shipments of considerable amounts of ore have been begun.

**PROGRESS OF GEOLOGIC KNOWLEDGE.**—The prediction made in last year's report that new veins belonging to the productive period of the earlier andesite would probably be discovered underneath the later overlying lavas has been fulfilled during the past year by the discovery of several such veins. In the Montana-Tonopah, north of the first large vein discovered (the Montana vein), another large east-west vein has been discovered and developed. This vein contains large quantities of rich sulphide ore, and has been called the "Macdonald vein." West of the Montana-Tonopah mine the Tonopah Extension shaft has cut a similar rich and large vein in the earlier andesite, in a portion of the district which, while on the borders of the formerly known productive region, had not been shown to contain any valuable ores. This vein, encountered beneath the overlying later andesite, is as strong as any of the other first-class veins yet developed, and may, indeed, be the extension of some of the earlier known lodes. Besides these important discoveries, fragments of similar veins broken by intrusion or faulting, so as not to have at present as great economic value as the unbroken veins, and similar veins of smaller size have been encountered in other mines, such as the North Star, the Midway, and the Tonopah and California.

**COMPOSITION OF ORES.**—A preliminary account of the early andesite ores was given in the last report, in which it was shown that the primary ore was essentially a rich silver sulphide, black in color and often antimonial. Since that time W. F. Hillebrand of the Geological Survey has made a prolonged chemical investigation of the ores, which is of great interest, as it touches their origin and their commercial treatment. The primary sulphide ore taken from the Montana-Tonopah (Montana vein) has the following composition:

### ANALYSIS OF SULPHIDE ORE FROM THE MONTANA VEIN, MONTANA-TONOPAH MINE.

Siliceous matter	15.18
Gold	.72
Silver	25.92
Lead	6.21
Copper	1.32
Iron	9.87
Manganese	1.36
Zinc	5.84
Selenium	2.56
Tellurium	None
Arsenic	.92
Antimony	.92
Magnesia	1.49
Lime	3.70
Carbon dioxide	6.34
Sulphur	Not determined

**VEINS OF A LATER PERIOD THAN THE EARLIER ANDESITIC VEINS.**—In last year's report (Bull. U. S. Geol. Survey No. 225, p. 98), it was noted that while the most productive veins were connected with the earlier andesite eruption, yet the subsequent volcanic eruptions also were frequently accompanied by silicification and vein formation, although these veins are of minor economic importance. It was clear even at that time that the most abundant mineralization and silicification, besides that connected with the earlier andesite, had occurred subsequent to the intrusion and extrusion of a more siliceous rock of later age. This rock was referred to at that time as the "early"

rhyolite, and was indicated on the map accompanying that report as rhyolite breccia. In the final report this formation is somewhat more accurately classified as rhyolite-dacite, and is specifically referred to as the Tonopah rhyolite-dacite. In intrusive bodies of this rhyolite-dacite, especially near the contacts, and lying within either the intrusive or the intruded rock, but preferably in the former, bodies of quartz, more or less mineralized, are very common. At the time of writing last year's report the chief examples known were the veins of the Mizpah Extension, one vein in the Desert Queen shaft, and the mineralization found in the workings in the Kiug Tonopah and the Belle of Tonopah shaft. During the past year, however, most of the working mines in the central part of the district have developed large bodies of this rhyolite-dacite and have encountered in this connection many of the characteristic quartz veins of this period.

These veins may be large and may carry values. They are easily confounded with the veins of the earlier andesite, just as the silicified Tonopah rhyolite-dacite, in which they usually occur, may be confounded with certain highly silicified phases of the earlier andesite. Such veins have been encountered in the Belle of Tonopah, King Tonopah, Mizpah Extension, Desert Queen, North Star, Montana, Tonopah, Mizpah, Midway, MacNamara, West End, Tonopah Extension and Ohio-Tonopah. On account of their resemblance to the earlier andesite veins they have been the object of a good deal of exploration and development work, which, on the average, has been decidedly unprofitable.

**CHARACTERISTICS OF RHYOLITE-DACITE VEINS.**—The veins of this period are characterized everywhere by irregularity and by a lack of definition and persistence, though their size may locally be great. As a rule they are elongated and have the appearance of regular veins, but cannot be followed as far on either the strike or dip as can the regular veins. They may disappear by scattering and passing into a silicified wall rock, or they may be cut off along a cross fracture. The quartz is, as a rule, dense and jaspery and either white, gray or black in color, and is therefore usually different in appearance from the white quartz of the earlier andesite veins. The veins are commonly barren or contain only very small quantities of gold and silver, except locally, where rich bunches of ore may occur, though of limited and irregular extent. In the Ohio-Tonopah barite occurs as a gangue mineral with the rhyolite-dacite veins. This mineral has not yet been found in connection with the earlier andesite mineralization. In the Desert Queen and the North Star, where quartz of the rhyolite-dacite period has been opened by drifting, a green stain forms on the walls, which is a basic copper sulphate. This phenomenon has not yet been noted in connection with the earlier andesite mineralization. Characteristic of the rhyolite-dacite veins, to which, however, there are numerous exceptions, is the greater ratio of gold to silver in them as compared to that in the earlier andesite veins. In the latter class of veins the gold averages about two-fifths of the value, the silver three-fifths, while in the former class the gold is apt to exceed this amount and sometimes to occur with practically no silver, although the proportion is very changeable. Often, again, the proportion of gold and silver is the same as in the earlier andesite veins.

A favorite place for these veins is on the upper contact of a rhyolite-dacite sheet with overlying decomposed andesite. Such, for example, is the situation in the Mizpah Extension, the MacNamara, Tonopah Extension and West End, and to a less degree in the Ohio-Tonopah. This fact is explained by the conception that ascending hot waters circulating through the fractured rhyolite-dacite rose until at the contact with the overlying soft, decomposed andesite they found a partially impervious barrier, along whose lower contact they circulated and deposited the materials which they held in solution.

**EFFECT OF WATERS PRODUCING THE TONOPAH RHYOLITE-DACITE VEINS ON EARLIER FORMED VEINS.**—Although as a rule a decomposed andesite seems to have presented a formidable barrier to the circulating waters accompanying the Tonopah rhyolite-dacite, in some places the waters must have traversed the andesite. Indeed, it is along the brittle andesite veins and silicified adjacent andesite that fractures and fissures must have been most easily formed at this period. In the case of the Tonopah Extension, the earlier andesite vein has been reopened, and along the hanging wall a new vein of barren jaspery quartz formed. This is probably due to waters of the rhyolite-dacite period of mineralization. In this case the new quartz is relatively barren as compared with the old. It is evident, however, that the effect of such solutions must have been to dissolve a great deal of the gold and silver contained in the earlier veins, and naturally to reprecipitate it elsewhere. Thus the ores might be reprecipitated in a concentrated form. This very likely has been the case in the Montana-Tonopah, where the original vein has been reopened, and in the fissure thus formed minerals similar to those in the older vein, but richer in gold and silver, have been precipitated in crustified form. It is reasonable to assume that this may have been the work of the waters of the rhyolite-dacite period, of the same kind and character as those to which the barren quartz hanging wall portion of the vein in the Tonopah Extension is due.

Again, it is natural that such waters may have dissolved some of the metallic contents of the older veins, and instead of precipitating them within these veins may have carried them out and deposited them elsewhere, as, for example, in the veins of the rhyolite-dacite, forming bunches of high-grade ore in these usually barren veins. This may be the explanation of the comparatively small amount of rich ore found in some of the rhyolite-dacite veins, as, for instance, in the Desert Queen and the MacNamara. These are practically the only veins of this period in the district that contain high-grade ore, and both these veins lie near rich earlier andesite veins. Veins in the rhyolite-dacite that lie farther away from the earlier andesite veins are frequently large, but are typically of low grade or barren.

These veins are plainly the results of ascending hot waters, and represent the effects of the Tonopah rhyolite-dacite eruptions, having the same relation to these eruptions that the earlier andesite veins did to the eruptions of the earlier andesite. The characteristic lack of definition and persistence in these veins as compared with the veins in the earlier andesite shows that at the time they were formed no definite fracture zones were available as channels, so that the ascending waters had to force themselves up along irregular courses. This mineralization is probably the same in time, nature and origin as that at Gold Mountain, which is 4 miles south of Tonopah, and may very likely be the same as that in the newly discovered camp of Goldfield, which lies about 23½ miles south of Tonopah.

**PROGRESS OF KNOWLEDGE OF UNDERGROUND FORMATIONS.**—It was explained last year that the geology at Tonopah was so complex that no accurate detailed knowledge sufficient to guide mining operations with certainty could be obtained far from the regions which have been explored underground by mine workings, and it was pointed out that with the increase in number of such workings the chances for successful mining in the immediate contiguous regions could be progressively more closely estimated. It has indeed turned out to be true that the developments of the past year have had this effect in adding to our knowledge of underground geology and in increasing our basis for future estimates. The actually productive area has been slightly but not greatly enlarged, and within this area, as previously mentioned, most of the mine workings have encountered serious drawbacks to successful mining in the shape of large and irregular bodies of the later and intrusive Tonopah rhyolite-dacite. These bodies do not come to the surface over most of the area, and their presence could not have been accurately foretold, although the probability that such intrusions would be encountered anywhere and everywhere was pointed out by the writer in his previous report. The complexity of the intrusions was not exaggerated in the ideal cross-section previously published.

Besides the intrusions of later eruptives, cutting off the earlier formed andesitic veins, the complicated faulting, characteristic of the district, which, in the early history of its development, made the Fraction vein practically impossible to follow and to exploit economically, has been found to manifest its effects in the other veins, entailing more or less serious hindrance to mining operations. The Mizpah vein is not only broken in detail by minor faults, but is cut off to the east, the west, and at the bottom by faults of greater magnitude. Within the important and rich veins of the Montana-Tonopah complicated faulting has operated so as to displace the ore bodies in a very puzzling way. These faults have different systems and their effect is too complicated for explanation within a short space, but they are explained more at length in the final report. The Tonopah Extension vein, up to the time of examination by the writer, had continued to be unusually free from faulting.

Outside of the known productive area exploration has been continued in those formations and in those portions of the district which were found by the writer to be more favorable than the rest. The chief work has been done east and west of the productive region, but it cannot be said that so far the results are highly gratifying. To the east the Halifax shaft has been pushed down to a depth of 800 feet and is in the later andesite from top to bottom. Work has been continued on the Rescue shaft, which is in a white rhyolite volcanic neck. Work in which a larger amount of hope could perhaps have been reasonably placed has been carried on in the area west of the productive region. In this area, as already noted, the Tonopah Extension has been successful, while the other workings have developed nothing of importance. The Ohio-Tonopah shaft, 770 feet deep, encountered a large body of the Tonopah rhyolite-dacite, and in this most of the drifting was done. The Golden Anchor shaft, situated in as favorable a position as could be chosen in this neighborhood, has reached a depth of 640 feet without definite developments. This shaft is mostly in the later andesite, with some rhyolite-dacite near the lower portion. Farther west, near the western limit of the area shown on the published geologic map, the new Pittsburgh shaft was, at the time of the writer's visit, in November, 1904, 570 feet deep in soft volcanic breccia belonging to a period later than the ore-bearing formations. North of this point, but also on the edge of the area mapped, the Little Tonopah shaft was at



that time 585 feet deep, and its bottom was still in the later andesite.

**SUMMARY.**—The Tonopah veins are similar in nature, composition and origin to those found in some of the richest mining districts, such as the Comstock of Nevada and the Pachuca in Mexico. Indeed, it is probable that all of these districts and many others lie within a single petrographic and metallographic province characterized by similar rocks and similar veins formed at similar periods. In the Tonopah district the rich ores occur in the veins in the shape of irregular shoots or masses (bonanzas), comparable in size and richness to the famous bonanzas of the districts mentioned. The geological conditions also indicate that such bonanzas were formed down to considerable depths. These are the striking advantages of the district, which have justified considerable expenditure of money in exploration.

The disadvantage of cost of production is common to all mines in the desert region, and if this were the only drawback the production of the district might reasonably be expected to become enormous. A greater disadvantage, however, as previously pointed out, consists in the disturbances to which the veins have been subjected since their formation. These disturbances consist of both repeated and copious intrusions of later volcanic rocks and of faulting which accompanied the intrusions, forming a condition illustrated in the ideal cross section published last year.

By these disturbances the veins have been broken in detail, and sometimes even displaced to such an extent that search for their continuation is practically hopeless. In mining, the expense of following the vein is increased by slight disturbances, and where the vein is greatly displaced a large amount of money must be spent in exploration, however intelligently this may be directed. When veins belonging to one of the later periods, especially that following the Tonopah rhyolite-dacite intrusion, are encountered, it may be difficult for the mining man to identify their character or class, and much expense is incurred in drifting along these in search of ore bodies, which, if encountered, are usually not sufficient to pay for the whole work done.

Moreover, the exploratory shafts which have been sunk, particularly during the last year, in the region around the productive area indicate that the earlier andesite, with its productive veins, if, indeed, it can be found in any large amount in these regions, lies under an average great thickness of the subsequent barren formations. Where these veins are very close to the surface, as in the present chief productive area, the difficulties of mining, as pointed out, are still so great as to make large profits often a matter of considerable doubt; and where similar mining and exploration must be carried on at an increasingly greater depth it becomes more and more doubtful whether the results will warrant the necessary outlay.

For these reasons, in considering the balance struck between the highly advantageous character of the ore and the origin and nature of the veins, and the disadvantageous circumstances introduced by late disturbances, it impresses the writer that the balance is at present rather on the disadvantageous side.

### Automatic Water Gauge.

Where gauge glasses are provided on locomotives, the engineers frequently throw them out of service and depend entirely on their try-cocks to inform themselves as to the water line in the boiler, the excuse being that the danger from a broken glass is greater than from anything else around a locomotive; and although it is seldom that satisfactory evidence can be found, it is almost certain that the majority of locomotive boiler explosions are caused by low water.

In the Shallow gauge, as illustrated, the automatic



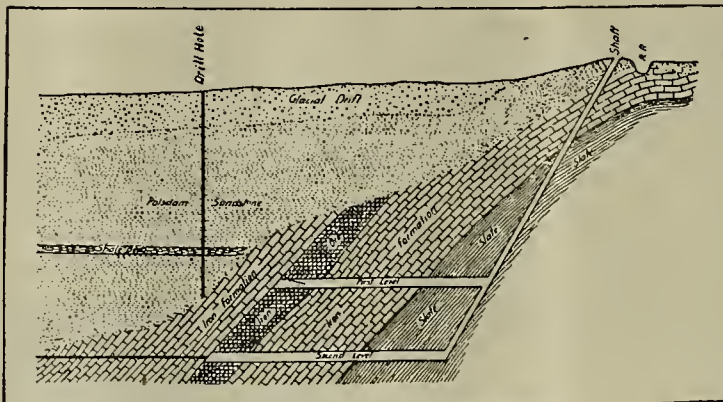
valve is not subjected to wear only when it is closed through the breaking of a glass, and as this is only at widely separated intervals, there can be no appreciable wear for years. The whole valve is constructed

of brass, with the design that no trouble be experienced from the collecting of sediment or scale and the consequent sticking of the valve.

The Shallow gauge is furnished by W. S. Haines, 136 S. Fourth street, Philadelphia, Pa.

### Mining in Korea.\*

Korea has vast and only partially developed mineral resources. With the settlement of the political difficulties which at present embarrass the progress of that country, it may be expected that these resources will receive more attention than in the past. At present the largest mining concern operating in Korea is the Oriental Consolidated Mining Co., an American organization, with offices in San Francisco, Cal. This company controls a large concession throughout which are mineral veins of greater or less value. Several of these veins have been extensively developed and equipped with modern machinery. Among the most important are the Chittababie mine, equipped with a 20-stamp mill, which started up in 1897; the Tabowie mine with a 40-stamp mill, which was completed in August, 1899; the Kuk San Dong mines (north and south), also



Cross Section Illinois Mine, Wisconsin.

equipped with a 20-stamp mill, to which it is intended to add twenty stamps. This extension of plant has been postponed for some time past, due to the war. The Charabowie and Maibong mines are equipped with a 40-stamp mill, which started up February, 1902. This mill is illustrated in one of the accompanying engravings. The Taracol mine is one of the most important of the company's holdings and is equipped with an 80-stamp mill, also illustrated, (see front page), and which was started in March, 1903. This gives this company's mines a total of 200 stamps. These mills crush on an average over 160,000 tons of ore annually, which, according to the official annual report of the manager, averages about \$6 per ton. For various reasons there has been considerable loss of time in the running of these mills.

The stamp duty at the various mills ranges between 3.1 tons and 4.1 tons daily. The several mills

accompanying illustrations are furnished. W. Deane, assisted by Elvin Wilcox, is putting in an extensive hydro-electric plant for the Oriental Co., and E. Poage is in charge of the dam. It is expected that the dam will be completed this year. The reservoir site is the Chorie valley, which will afford a large reserve. It is the intention, by way of experiment, to stock the reservoir with American trout, for which the Fish Commission has agreed to supply the necessary stock. Under existing conditions mining in this part of the Orient is not all that an American may desire, but the mines of the Oriental Co., while subjected to many annoyances, have not met with any serious losses as yet, and have been able to operate on nearly full time.

### Value of Geological Knowledge.

Written for the MINING AND SCIENTIFIC PRESS.

A knowledge of geology often saves the miner much annoyance, much loss and useless expenditure of time. It is true, without doubt, that the greater number of discoveries of prospects which eventually become mines are made by prospectors who have only a limited knowledge of geology, but this does

not prove nor indicate that those having such geological knowledge would not be likely to have made the discoveries made by others. As a rule, those who have an expert or even a fair knowledge of the science of rock formations are engaged in some pursuit affording a more certain result than that upon which the prospector can depend.

It is usually after the location discovered by the prospector has developed into a mine that the services of the geologist become valuable. His knowledge may then be of value in determining how development work should be directed. It is often as important to know what not to do as it is to know what should be done in a mine.

The writer once knew a successful prospector who had discovered a prospect and was developing it as well as his limited means would admit. He finally decided that the only way to find the main ore body



Forty-Stamp Mill, Maibong Mine, Korea.

are equipped with concentrators and cyanide plants, and many improvements have been and are still being made. The war has caused many stoppages and has increased the cost of production materially. H. F. Meserve is manager. Each large camp has a separate superintendent. The San Francisco representative is J. S. Wallace, through whose courtesy the

\* See illustrations on front page.

and to get into the payable ore in quantity was by sinking a shaft. He expressed his intention to another miner who had some geological knowledge. The latter at once assured the prospector that to do so would only result in disappointment, as the shaft would in a few feet pass out of the ore-bearing formation into barren porphyry. The prospector was advised to drift to the west, as in that direction



lay his only hope for improvement. Following this advice the prospector ran a crosscut westerly and in less than 10 feet had opened a 4-foot vein of pay rock. Had he followed his own inclination he would have exhausted his resources, found nothing and probably abandoned the claim.

The accompanying sketch shows what is really a simple geological situation, and yet the prospector, unfamiliar with existing geological conditions, would scarcely dream of an ore deposit underlying the glacial drift and sandstone. Geologists of experience had studied the surrounding region, the Baraboo range in Wisconsin, and although there is no mineral outcrop, their knowledge of geology enabled them to intelligently locate the bore hole which resulted in the discovery of the ore deposit which made the Illinois iron mine. Not only were the strata largely covered with glacial drift, but there were other drawbacks to mining operations there. Here again a knowledge of the geological structure enabled the engineers to overcome these difficulties.

At the Illinois mine, after attempts to sink the shaft through sandstone, it was decided to penetrate the footwall slate by a shaft dipping 60° north and to crosscut the ore through the underlying strata. After reaching the iron formation at a depth of 30 feet, but little water was encountered, and still less after the latter was reached, at a depth of 100 feet. In mining the ore above the first level more water is encountered than from below on account of the proximity of the sandstone. The amount of ground water in the crystalline rocks associated with the ore in the Illinois mine is comparatively small, the movement being entirely through irregular fractures pervading the formations. In the near vicinity of the contact with the overlying sandstone, within 50 or 65 feet, many of the rock openings extend to the sandstone, and water is abundant. The ground water level in the valley is generally within a few feet of the surface.

At Leadville, Colorado, numerous rich strikes have been made the past year, largely due to a knowledge of the structural geology of the district, and the characteristics of the ore bodies.

## Experiments on Ore Sampling.\*

Written by A. T. FRENCH.

The following notes relate to the reduction of samples from about 100 pounds weight to 5 to 10 pounds, a quantity suitable for grinding down in the laboratory. The well-known process of coning and quartering undoubtedly gives satisfactory results, but it is a slow and rather tedious operation. Among others, the following two methods have been proposed with a view to saving time:

(a) THE "CANVAS" METHOD.—In this the principle is the same as in the coning and quartering method, but time is saved by using a sheet of stout canvas about 6 feet square, instead of or better upon the usual iron plate. The breaking up, when a suitable ore crusher is not available, is done with hammers on an old casting or a block of hard stone placed on the canvas, and when sufficiently small the sample is mixed by rolling from end to end of the canvas. Finally it is brought to the center of the canvas, the four corners of which are gathered together and shaken to detach any fine dust, and the sample is then divided into four, and two opposite quarters taken away in the usual manner. The two remaining quarters are mixed as before by rolling and the process repeated any desired number of times.

(b) THE "ALTERNATE SHOVEL" METHOD.—The sample is broken up on an iron plate, shoveled into a cone and mixed thoroughly by shoveling over twice, always forming a cone and placing every shovelful upon its apex. The cone is then shoveled again, every alternate shovelful being kept and the rest rejected. The new cone thus formed is reduced in the same way any desired number of times, further mixing being unnecessary except after breaking up again. There are always some fines left on the plate after shoveling. These are swept into a heap and carefully divided, half being placed on the apex of the cone and half thrown away. When the sample is not more than 20 to 30 pounds weight it is better to use a small scoop holding ½ pound or so of the mineral. In order to test these two processes, a number of samples were divided into two portions, some by method a and some by method b, and the two portions treated as separate samples, being further divided until about 6 pounds of each were left. These were then broken up in the laboratory and carefully assayed for copper. The ore on which these experiments were carried out was a pyrites, carrying chalcopyrite, with a highly siliceous gangue. When broken up, the fines were very much richer than the coarser

material. The samples averaged about 100 pounds in weight and had been crushed to 1½ to 2-inch cubes through a rock breaker. They were then broken down by hand to about 1-inch cubes and divided twice by the method chosen, giving two 25-pound samples. These were further broken down to about ½-inch cubes and divided twice more, giving the final samples for the laboratory. Results were as follows on eight samples:

	METHOD A.		—Canvas Method—	
	Original.	Duplicate.	Original.	Duplicate.
Copper, %	2.90	2.85	3.67	3.57
	3.48	3.48	3.48	3.48
	10.90	10.70		
	METHOD B.		—Alt. Shovel Method—	
	Original.	Duplicate.	Original.	Duplicate.
Copper, %	2.90	2.85	3.67	3.57
	3.48	3.48	3.48	3.48
	10.90	10.70		

From the above it will be seen that the "canvas" method gives the best results, especially when dealing with rich ore.

For a further test six bags of 9% to 10% of the ore were treated, two by method a, two by method b, and two more, for comparison, by the coning and quartering method. The times were also taken, and were, exclusive of breaking up the samples:

	Av. Min.
Method A.....	21
Method B.....	18
Coning and quartering.....	27

Results were as follows:

—METHOD A—		—METHOD B—		Coning & Quartering Method.	
Canvas Method.		Alt. Shovel Method.		Orig.	Dup.
Orig.	Dup.	Orig.	Dup.	Orig.	Dup.
8.97	9.07	9.45	8.67	8.87	8.77
9.83	9.70†	9.96	10.07	9.02	9.00

This second series of experiments, then, confirms the first, showing that the "canvas" method is more reliable than the "alternate shovel," and that it has about the same degree of accuracy as the "coning and quartering" method, while taking nearly a quarter less time.

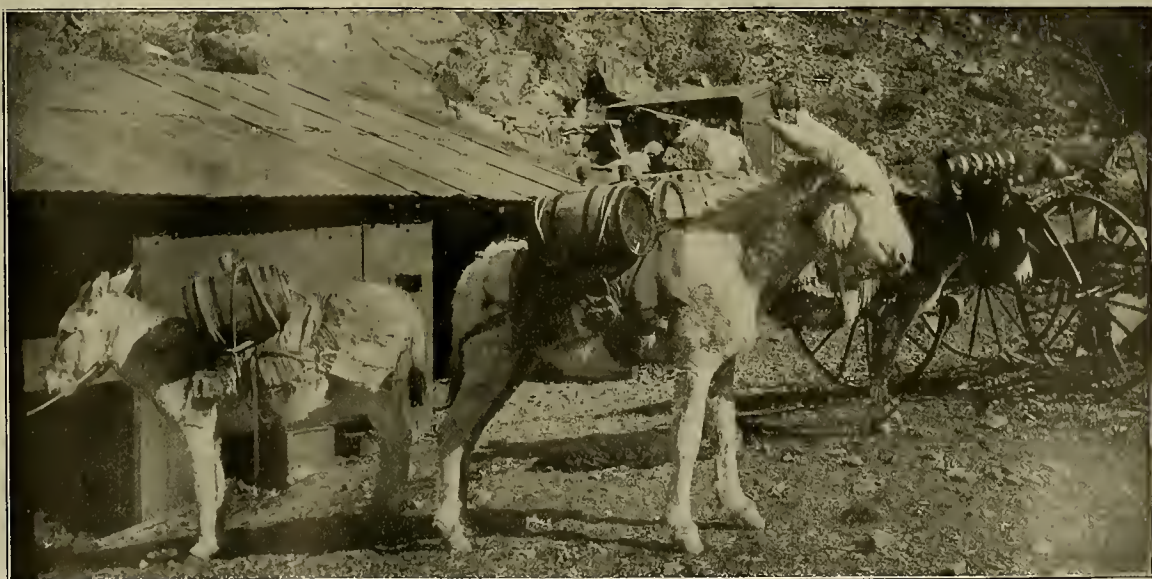
It having been suggested that the fines might stick to the canvas and thus collect in the portion kept, enriching it at the expense of the "rejections," in this case the whole of the rejections from the two duplicate portions of the original sample were saved, broken down small on an iron plate, and divided down by the coning and quartering method. This sample assayed 9.90—0.1% higher than the average of the other two.

## Prospecting for Desert Mines.

Ever since the venturesome argonauts first crossed the plains and mountains from the East, seeking fortune in the great, undeveloped and unknown West, the desert region of the western United States has had a sort of fascination for the prospector. It is a land of marvels. It contains strange minerals, rich mines, a flora and fauna all its own, and climatic conditions not found elsewhere. Men who have spent many weeks on these arid wastes came in time to

panion of the prospector on these venturesome trips is either the sturdy broncho horse, raised on desert ranches, or the even more hardy burro. The latter requires less fodder, less water, and on the whole less care than the horse, and is generally more tractable. He packs the miner's outfit of tools, grub and water, and together they share the hardships and in a small measure, the benefits of the trip. The accompanying illustration shows the manner of packing the burro as a water carrier on the Mojave desert of California. Without him life would be all but impossible to the prospector, before a permanent camp is established, from which it is safe to radiate in all directions in search of prospects. In the early days on these great Western deserts many "pilgrims" lost their lives. In almost every case these deaths occurred from lack of water and the unfortunate men and women met their fate in the valleys. As the country became better known it was learned that there was often a better prospect for water by going into the hills. There springs were occasionally found, or water had accumulated in natural depressions in the canyon bottoms (called by the miners tanks) from the infrequent rains.

All desert travelers know how easy it is to pass a good spring of water and not see it at all. There are many places where large springs break out from rock ledges and flow a few yards, to be wholly absorbed by the sands. A traveler may pass sometimes within 100 feet of one of these springs and see no sign of it. Old Woman's springs, 45 miles east of Victorville, San Bernardino county, Cal., is a case in point. There is a spring discharging about fifty gallons of good water per minute, and yet one may pass within 100 feet of it on the bluff above and never suspect its existence. Paradise spring in San Bernardino county, Cal., north of the Calico range, is a few hundred yards off a main traveled road and would not be suspected by a passing traveler who did not know of its existence. These are but two of a score of similar instances known to the writer occurring in Utah, Nevada, Arizona and California. Notwithstanding its many drawbacks, there is a charm about the desert which is almost irresistible. The atmosphere is clear and pure, and although the heat and metallic glare of the day are at times almost unbearable, its cool nights are refreshing and invigorating; its sunrises are gorgeous, and its sunsets indescribable. Slowly the deserts are being reclaimed. Railroads have been built across them and still others are building. Vast areas are coming under cultivation by means of irrigation, and the springing up of prosperous mining camps will do much to rob the desert of its terrors, both real and imaginary. All this radical change is due to mining. The possibility of finding mines at first induces the prospector with his burro to penetrate the vast wilderness. The development and operation of the veins he finds gives employment to thousands of men, and cities spring into existence as a natural consequence. This offers an inducement to capital to construct railroads, and the large communities thus formed and existing make the tilling of the land advantageous wherever water can be obtained for the purpose of irrigation. It cannot be anticipated that climatic conditions will materially change, though there is abundant evidence



A Desert Camp With Water Train.

admire its vast solitude, its rugged mountains, its trackless valleys — trackless because often well-known roads and trails are wholly obliterated in a few minutes by the driving winds which sweep across the plains, whirling great clouds of sand and dust high in the air, shifting good-sized hills of sand from one position to another. The prospector goes out into the desert region with little if any misgiving as to his ability to safely return and perchance to find his fortune in the form of a rich mine. Others have done it before, and each prospector feels sanguine of his own success, and believes in his luck. The com-

of other conditions than those now existing having obtained on the desert in the past, and that within comparatively recent time. Great cottonwood logs are found buried in the sands of some basins, a few feet below the surface, where no living trees now exist. Lake beds have been filled with sand washed in by the deluges of rain which fall from time to time, and there are numerous indications that the rainfall is now less than it formerly was on some of these desert valleys. Whether the present conditions of nature will improve or grow worse for the habitation of mankind remains to be seen.

\*Bull. of Inst. of Min. and Met.

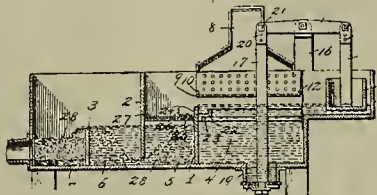


## Mining and Metallurgical Patents.

PATENTS ISSUED MAY 30, 1905.

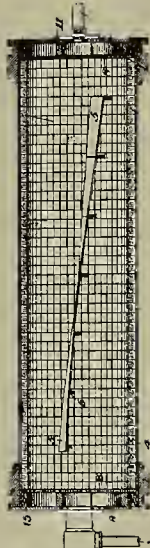
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINERAL RECLAIMER AND SAVER.—No. 790,913; H. L. Orr and F. B. Finley, Fort Collins, Colo.



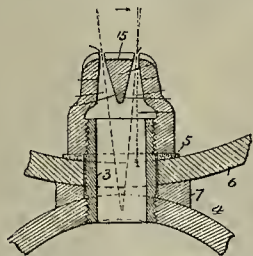
In apparatus of class described, tank divided into plurality of compartments of different sizes, each containing filtering medium, screen arranged in larger compartment, automatically operating means for maintaining level of liquid within tank, trough arranged below screen, filtering medium arranged adjacent to larger compartment, and communication between trough and latter compartment.

TUBE MILL.—No. 790,927; G. H. Sharp, Jonesville, Mich.



In tube mill, horizontal, rotatory cylinder having inlet and outlet orifices, interior, wooden grinding surface and arranged to contain mass of grinding bodies, cylinder having set of longitudinally extending, helical shelves secured therein and arranged to lift contents of cylinder and drop them during its rotation, inclination of shelves tending to retain grinding bodies near inlet orifice.

JET NOZZLE FOR WET CONCENTRATORS.—No. 791,387; J. L. Weaver, Boise, Idaho.



Jet nozzle for wet concentrators provided with parallel elongated discharge openings, and contracting passages leading thereto, formed by converging walls inclined from perpendicular and inner wall of each passage having greater angle than outer wall, whereby water is discharged in sheets diverging from nozzle.

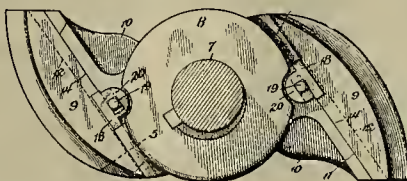
WATERPROOF EXPLOSIVE CAP FOR BLASTING PURPOSES.—No. 791,100; E. W. Keith, Denver, and A. H. Boyd, Leadville, Colo.



In fuse and explosive caps, combination of shell charged with charge of explosive material in bottom portion, gasket or disk-shaped ring of soft rubber adapted to be dropped loosely in shell on top and against covering of explosive charge, fuse adapted to

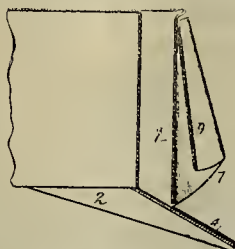
be inserted in shell against top of ring-shaped gasket, and indentations in entrance edge of cap arranged to clamp fuse to cap and under pressure against top of gasket.

CAM.—No. 791,043; G. S. McLeod, Phillipsburg, Mont.



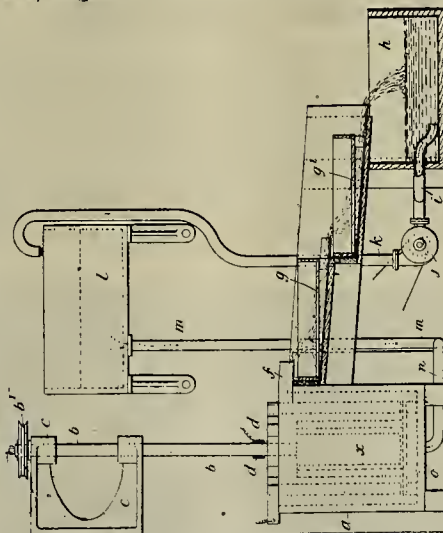
In cam, combination with hub member having flat outer face, of shoe member having outer curved face and opposite flat inner face extending longitudinally of same and to opposite ends of curved face and adapted to rest against face of hub member, one of members having longitudinal recess in flat face and other member having longitudinal rib that is arranged to engage in recess.

MINER'S LAMP HOLDER AND HEAD PROTECTOR.—No. 791,231; I. Wantling and S. Doubet, Peoria, Ill.



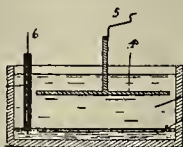
In combination with cap, lamp holder consisting of plate secured to cap its side edges intumed, second plate having side edges secured under intumed portions of first mentioned plate, and body of second plate provided with crimped portions forming air passage between two plates for circulation of air, and second plate having central body portion concave.

ELECTROLYTIC DEPOSITION OF METALS.—No. 791,341; H. C. Harrison, London, and J. Day, Weston-super-Mare, England.



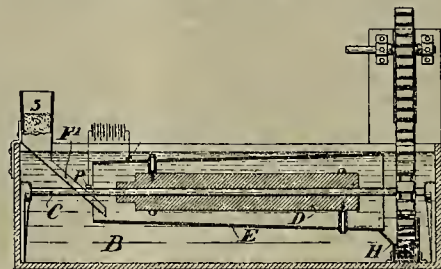
Method for effecting, with high current density, rapid electro-deposit of tough and homogeneous metal with smooth surface, which consists in simultaneously revolving cathode and directing tangentially all around vertically mounted cathode, so as to approach surface of cathode tangentially and cause swirl of electrolyte at all points around cathode and throughout length thereof, series of jets arranged certain distances apart, whereby rapid and continuous change of electrolyte immediately contiguous throughout length of and all around such surface of cathode is effected.

PROCESS OF EXTRACTING ZINC FROM ITS ORES.—No. 791,401; A. G. Betts, Troy, N. Y.



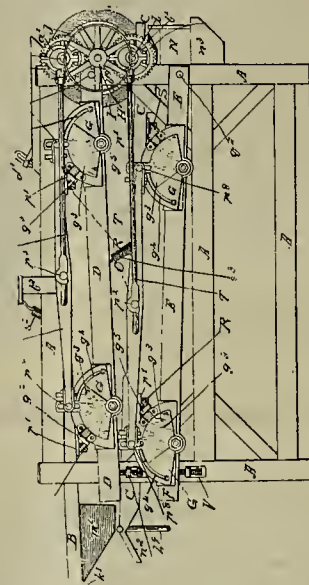
Process of extracting zinc from ores which consists in dissolving zinc therefrom as solution of zinc sulphate, electrolyzing solution with liquid metal cathode for production of zinc alloy, and electrolytically extracting zinc from alloy and depositing zinc on suitable cathode.

ART OF SEPARATING GOLD OR OTHER DIAMAGNETIC METALS.—No. 791,305; L. T. Weiss, New York, N. Y.



Herein described process of separating solid particles of diamagnetic metal from accompanying matter, which consists in first coating with magnetic metal by electrolysis such diamagnetic particles and separating such coated metallic particles from accompanying matter by magnetic means.

CONCENTRATOR.—No. 791,200; C. O. Michaelsen, Salt Lake City, Utah.



Double-floored concentrating table adapted to oscillate in any direction and consisting of longitudinally inclined upper and lower floors within upwardly projecting sides, with space between two floors, upper floor provided at upper end with adjustable transverse openings communicating with lower floor which is also provided with adjustable transverse openings at lower end communicating with box chute for conveying water and pulp to lower table located under double table, lower table inclining in opposite direction from pitch of double table which is actuated by means of two bolsters, pivoted to table at points midway of its longitudinal direction, bolsters being pivoted at each end to pins of cranks forming part of articulation, in such manner that when articulation are adjusted and operated by suitable means, desired movement will be imparted to bolsters, and through them to table, each of tables being independently adjustable as to inclination.

BIT FOR ROCK DRILLS.—No. 791,264; M. Hardsocg, Ottumwa, Iowa.



In combination with bit provided with longitudinally extending passage on interior opening through cutting face, socket provided with shank adapted for insertion in pneumatic tool, shank being provided with longitudinally extending passage adapted to communicate with passage in bit, and series of radially arranged diverged openings leading from longitudinal passage and adapted to discharge excess of exhaust air.



## Thirty Days of a Mining Engineer's Life in Mexico.

NUMBER II—CONCLUDED.

Written for the MINING AND SCIENTIFIC PRESS by  
E. A. H. TAYLOR.

Much to our disgust within half an hour it cleared up completely and the night was clear and cold. By daylight we were on the road again and had hardly gotten well under way when it clouded up rapidly, and almost immediately sleet began to fall, driven by a sharp, cold wind. The sleet turned to snow, and alternating between snow, sleet and rain, accompanied by a piercing wind, it kept up for forty-eight hours with but few intermissions.

We dropped down a mountain side into a little valley, where we found a projecting ledge of rock, and being far from comfortable myself, and noting that my mozo must be suffering, I decided to camp. By the time we had unpacked and stored our baggage and got a fire started we were nearly frozen, but after getting breakfast were all right.

That night we slept under the ledge, but there was hardly room, and during a heavy shower during the night the water dripped down on my bed, and I awoke to find one-half of my bedding well soaked. Once in the night it cleared up, but awakening at daylight I found the trees covered with snow, but as it was raining then in half an hour it all had disappeared. And so broke the day of April 1, 1905.

It clearing up a little by 9 A. M. we got under way, traveling three hours in all kinds of weather until we reached a ranch called "Vuelas del Rio." Here we stayed until the next morning. About dusk that evening the Federal mail went by—four sacks packed on a mule driven by a native on foot—who, as the creeks were up, had stripped himself to jumper and drawers, these last being rolled up as high as he could get them, and bare legged, thinly clad, was running along behind, keeping his mule on the trot. I was standing by a fire, well huddled up in my overcoat, and was none too comfortable. How must the mail carrier have been? It was sleeting then, but with a hearty "adios" he trotted by, making for a little ranch 3 miles above.

The next morning broke clear and crisp, the world being dressed in white. We got an early start in spite of the cold, and nearly froze for two hours until the sun got well up. The country was rough and rocky and the coating of ice and snow made traveling dangerous, as the foothold for the mules was none too secure. However, we had no mishap, and by noon the world was bright and gay and the weather delightful. Just before noon we went over the highest range on the route, 8700 feet above sea level. By 4 P. M. we had dropped down into the "Valle de Topia"—the headwaters of the Humaya river—and were only 3700 feet above sea level. In the morning we were surrounded by ice and snow, and here we had roses and oranges in bloom, and alongside peach and apricot trees loaded with green, half grown fruit. We forded the river, deep and swift, and climbing over a ridge dropped down into the little mining camp of San Bernabe.

From Tepehuanes to El Valle the formation consists of tuffs and agglomerates from 1000 to at least 3000 feet thick. Here in the valley the first solid rock is disclosed—andesite—and at San Bernabe it is crossed by silver-bearing ledges.

We reached San Bernabe just at dusk and were cordially received by the owner of the house where we applied for permission to stop, he apologizing to us for the lack of accommodations.

The altitude at San Bernabe is about 4000 feet, and the temperature was quite in contrast to what we had enjoyed (?) the night before. We slept under the little porch, tying our mules to the posts of the same. Here man and beast fed well and rested well, and at break of day the next morning we took our leave and started to climb the mountain, over which we had to go in order to reach Topia. We climbed steadily for just two and one-half hours and on the summit were 7000 feet above sea level. Here we found remains of snow and some ice, and as we began to ride down the valley to the west the stream got deeper and deeper.

Here also we noted the effects of the recent storm, as in many places the road was obstructed by fallen trees. The tuffaceous summits of the Sierras are well timbered, although the timber is mostly of small size—12 to 16 inches in diameter and 80 feet high. This is not surprising, as there is no soil, the trees holding themselves in or on the porous rock. Even the pines can penetrate this but a few feet, and in many parts the surface is a network of roots running in all directions. The tufa being soft and porous absorbs water in the rainy season, and here the pines find a place to root and grow. The more compact rocks, not absorbing moisture, and the thin soil covering them soon drying out, accounts for the lack of timber around most mining camps in Mexico.

The frequent forest fires and the lack of soil on the tufa mesas and ridges account for the small size of the timber encountered as a rule.

It took us one hour of continuous climbing to reach the edge of the tufa cap, and I noted several mines

in exploitation as we climbed, one reaching up to the contact.

Once on top we found ourselves on a mesa covered with more soil than is usually found in the Sierras, and here the growth of pines was the finest I have ever seen in Mexico. For half an hour we rode down a valley that gradually narrowed to a canyon, through which roared an almost impassable torrent. Suddenly we came to the edge of a precipice and the valley of Topia was at our feet. The town was about 5 miles away and 1000 feet lower, but it took us one hour and thirty-five minutes to reach it. The road leading down into Topia from the summit is a typical mountain trail, and is very steep and very rough for the first mile; and in many places is built up for 20 feet or more in height, and is paved with rough boulders for long stretches as it meanders back and forth along the face of the tufa bluff.

Topia is a very important lead-silver mining camp. The formation here is andesite. It is located at the head of a valley, 5500 feet above sea level, and is surrounded on three sides by bluffs, the tufa capping over the andesite. This cap surrounding Topia varies from 200 to 1000 feet, it being thinnest at the back of the town, to the north, where the andesite rises up nearly through it.

Topia has had hopes of a railroad from the coast, but there being no outlet to the east, it being in a veritable "cul de sac," these hopes are not likely soon to be realized. It is said that many of the mines average about forty ounces silver per ton, but as the superintendent of the Madnegada mines said to me, "It costs us \$30 a ton (Mex.) to place our ore in Culiacan, and then it is nowhere," it can readily be seen that forty-ounce ore is not good enough.

There are two mills in the camp, about 1000 feet below the town, on the creek, run by water power. The hand-sorted ore and concentrates are shipped and the remainder lixiviated, with more or less success.

We arrived in Topia just before noon, and as I was informed that the creek in the canyon below was impassable, we stayed there until the next morning. When we arrived at the creek the next morning, after an hour's ride down a steep, but good trail, we found the water still deep, though it had fallen 6 inches during the night. We crossed the first half dozen fords without a mishap; but after that we began to find pack trains camped all along the trail, and as we neared where the water and trail ran through a narrow, deep gulch we found packs of all kinds piled on each side of the trail, telling of woe to the packers the day before.

Where the trail goes down the gulch for 50 yards it is not over 20 feet wide, the trail following a narrow, smooth rock ledge on the side, then running down the center, along a ridge worn smooth and slick by ages of polishing, it then crosses back to the edge. This was covered for the whole distance with about a foot of water, while at the side was a seething whirlpool 8 feet deep. And we had to ride down that trail. When I came to the place where the trail enters the water my mule refused to travel, and when I remonstrated with the spurs she returned the compliment by kicking one of the stirrups off my foot. Finally we started, and I guess we both held our breath; I did any way, for at every step I expected we would slip, and that meant a swim. All three of us—myself, the mozo and the pack mule—passed in safety here, but we were not to escape.

Two and a half hours ride farther down the canyon another stream joined ours, and then the real fun began. Almost every ford was deep enough to reach the saddle, but as we were going with the current we were really pushed across. About 11 A. M. our pack mule lost her footing, and for a moment was lost to sight. As she fell up stream the current aided her to her feet, but everything was wet through. A little farther on the stream ran through a narrow gorge, with perpendicular walls on each side. The only apparent route was along one wall and for a few yards we went all right, but suddenly it deepened, and the next I knew we were swimming. I immediately turned the mule's head for the opposite side, and after rushing along for 20 feet (all in a second) we struck high ground again, but I was wet to above the waist. The pack had another soaking. After I had emptied the water out of my saddle bags we resumed the march. About 1 P. M. we arrived at some houses where we bought fodder, and about half a mile below went into camp. Everything was spread to dry and in two hours we were ready for the road again.

I noticed several times that we had companions in hard luck. At one crossing a poor burro lay. He had fallen and before help could reach him had drowned, as the pack held him down. Another mule—of a train we met—loaded with sugar, had fallen, with the result that syrup was oozing from every crack of the boxes.

Just at dusk we arrived at a little ranch and stayed for the night. We secured corn and fodder for the mules, and by buying a plate of hashed beef at one house and tortillas at another, my mozo and I made a fair meal without drawing on our own supplies. One is struck by the number of ranches along the canyon; every patch of even one-quarter acre is cultivated. We had traveled nine hours and forty minutes that day and in eight and one-half hours had crossed the stream 92 times.

The next morning, bright and early, we were

under way, and by 11 A. M. reached Aguacaliente, the point where the canyon enters and the trail leaves the river. We had crossed the stream 59 times during the morning, making 151 times in all.

That night we reached Milpas, where man and beast fed well, and the next day, April 6, crossed the stream, now the Tamazula river, for the 153d time, and at 1 P. M. reached Culiacan, our destination.

## Concentration of Zinc Ores.

The following interesting description of the concentration of zinc ores at Kaslo, B. C., is from the Kaslo Daily News:

The zinc plant, built by the Kootenay Ore Co. at Kaslo the past fall and winter, is completed and in operation. The building, 80x75 feet, adjoins the company's sampling plant, and is so situated on the banks of Kaslo bay that the ore is received from railroad cars at the top and delivered to the steamers beneath by gravity.

The ore is received in large bins below the level of the track, from which it is fed by automatic feeder to the roasting furnace, of the White-Howell revolving type, with a capacity of 60 tons per 24 hours and upwards, according to the amount of roasting required. After being roasted the ore is cooled by passing through an iron revolving chamber, where it is rotated through currents of cooled air, and thence, after a preliminary sizing and recrushing of the oversize, the ore is elevated to the top of the building, where it is subjected to close classification, eight bins being provided (with accommodation for more if necessary), to contain the various degrees of fineness, each accurately sized. The ore is now ready to be delivered by an automatic feeder to the process of magnetic separation, whence the finished product proceeds directly to the shipping bins.

The plant is working smoothly, and the results so far obtained have been very satisfactory, the product ranging from 50% to 55% zinc, with a minimum of iron. As the success of this process depends largely upon close tests and experiments of the action of every separate grade and class of ore during every stage of the process, there will be no haste used in pressing the output during the next few weeks, an interval which is being used by the mines in starting up their concentrating plant after the winter rest.

The plant has been designed throughout on liberal lines as to capacity and space; there is room for any additional amount of bin accommodation, and for the addition of any number of other magnetic machines which may be found necessary as the business increases. As the process of development in the mines may reveal zinc ores of a more complex and difficult character than has occurred so far, requiring a special type of machine for dealing with each variety, ample space has been allowed for any such additions in future without the delays involved by alterations of the building or foundations.

The broad effect of a custom plant of this character being in operation at a point accessible to the zinc-producing mines of the Slokan district will be that the vast bulk of ores containing zinc hitherto occurring in the mining of silver-lead can be saved and shipped as an important addition to the profits of the mine, instead of being sorted out at considerable expense and thrown away, as has hitherto been the case. The importance of this factor in the mining, as well as in the transportation, business of the district is very great. In many mines the occurrence of a body of zincy material has put a stop to further development. Now the actual work of development can be made profitable with a market offering for the zinc material, in addition to which the opening up of new bodies of lead ore must inevitably follow the working of the intervening zinc belts.

In mines which have concentrating mills it has been found difficult by wet concentrating to make a payable zinc product, which must exceed 37% zinc, a point at which it does not pay to ship. The magnetic process, by raising the grade of the zinc concentrates 50%, makes the product salable at a good profit. Many mines which have no mill contain bodies of zinc ore worthless as they stand, but which, by magnetic separation, can equally be made salable.

To the transportation companies no less than to the mines the marketing of this immense additional tonnage may represent an asset of great value; but it must be remembered that the comparatively narrow margin of profit in dealing with zinc ores absolutely demands that they shall be handled at the lowest possible cost, and therefore on a fairly large scale. In order to realize from this district the full benefits which the zinc business offers, it is imperative that the transportation companies should do their share in opening up this new source of revenue. Facilities for the cheap handling of these ores in bulk, as well as transportation rates which make it possible for business to live at the start, will amply repay the transportation companies in the tonnage which can be built up; but it is essential that aid in this direction should be forthcoming at this stage. The mines have done what they can in remodeling the equipment of their mills so as to save the zinc instead of treating it as waste; and now the Kootenay Ore Co. has provided in its custom plant for zinc separation at Kaslo the further link that was needed to turn out a marketable product.



## The Rational Design of Head Frames for Mines.

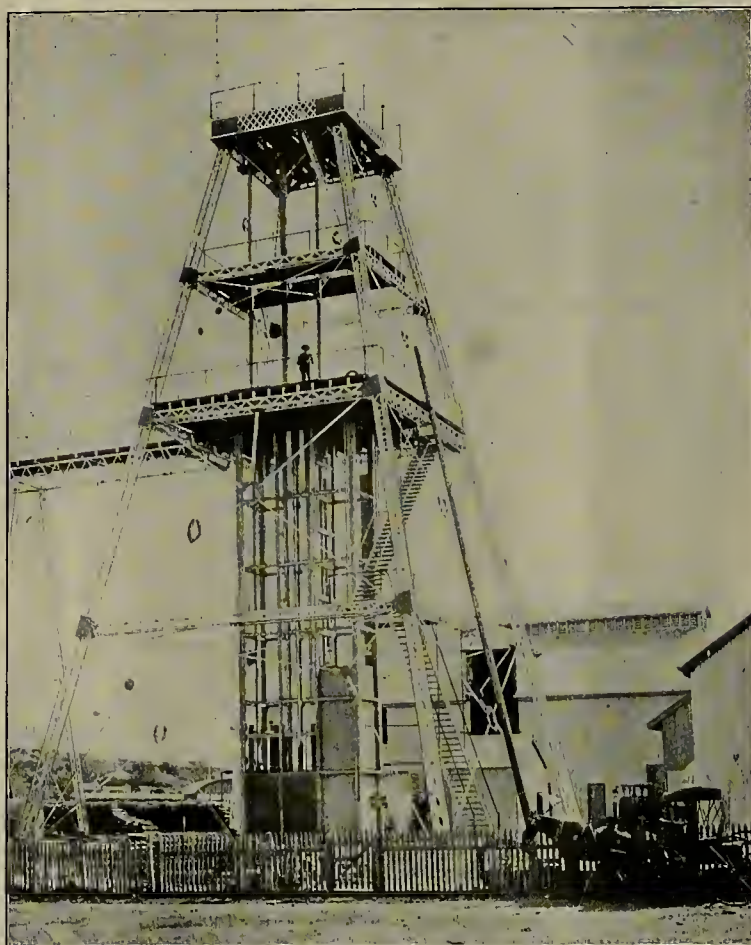
Written for the MINING AND SCIENTIFIC PRESS by  
GEO. S. BINCKLEY.

In an article published some years ago in the MINING AND SCIENTIFIC PRESS the writer called attention to the very bad design generally exhibited in the head frames used, not alone in the cruder and more remote mining districts, but in those farthest advanced along other lines of development and equipment. Those remarks and the illustrations that accompanied them were not intended as a criticism alone, but to indicate a line along which improvement might be made, and attention was called then to the nature and direction of the strains that are to be resisted by such structures, and the almost total disregard shown such facts in the great majority of head frames then in use.

So long as the structure under consideration was a crude wooden affair this state of affairs was not so surprising, but when the design was made under the direction of the engineers of some responsible concern engaged in structural steel work it was to be expected that a different class of structure would be developed. In many cases, however, especially in Australia and South Africa, the steel was merely substituted for wood, and the old style was adhered to. The result of this carelessness has been the construction of some steel head frames that are, to say the least, astonishing when the nature of the strains which they are expected to resist is considered, and illustrate a wasteful use of material that would not be countenanced for an instant in a roof truss or bridge.

The writer had, about the time of the publication of the article referred to, completed the designs and seen the successful construction of four very heavy steel head frames in Butte, Mont., these frames being erected on the High Ore, Mountain View, Leonard and Diamond shafts of the Anaconda and Boston & Montana companies.

The principle of the design of the head frames referred to was based on the fact that the pyramid is the form of maximum stability. The sheaves were so placed that the working strains were transmitted, with a very small amount of eccentricity, directly to the foundations under the four main corner posts, and in actual service these structures proved to be all that could be desired in stability, although two of them, having a height of 100 feet to the center of the sheaves, had a relatively small base. The accompanying engraving of the High Ore frame at Butte, Mont., is one of those in question.



Steel Head Frame of Four Post Type.

Radically as these structures departed from the form common at that time, further study and investigation indicated that a much greater degree of economy of material and superior stability could be attained by a modification of the principles of design,

and the writer now offers for the consideration of mining engineers a design for head frames which he believes to represent in its principles the minimum expenditure of material for a certain factor of safety, combined with the maximum of stability under service conditions and greatest convenience in handling ropes, cages and skips.

This design, shown in Figs. 1 and 2, is as consistently applicable to wooden structures as to steel, and while the value of the material involved might not be as important in the former case, the superior rigidity to be attained is of great importance.

The principle on which this design is based is the transmission of the working strains on the sheaves directly to the foundations, in a straight line, and without the introduction of working strains in the bracing system of the structure. This end is attained by placing the sheave bearings directly on the ends of the two main inclined back columns, which, spread well apart at the base, are brought close together at the top. The inside bearings of the sheaves (in case more than one is used) are carried by a short beam of such depth and stiffness as to preclude the

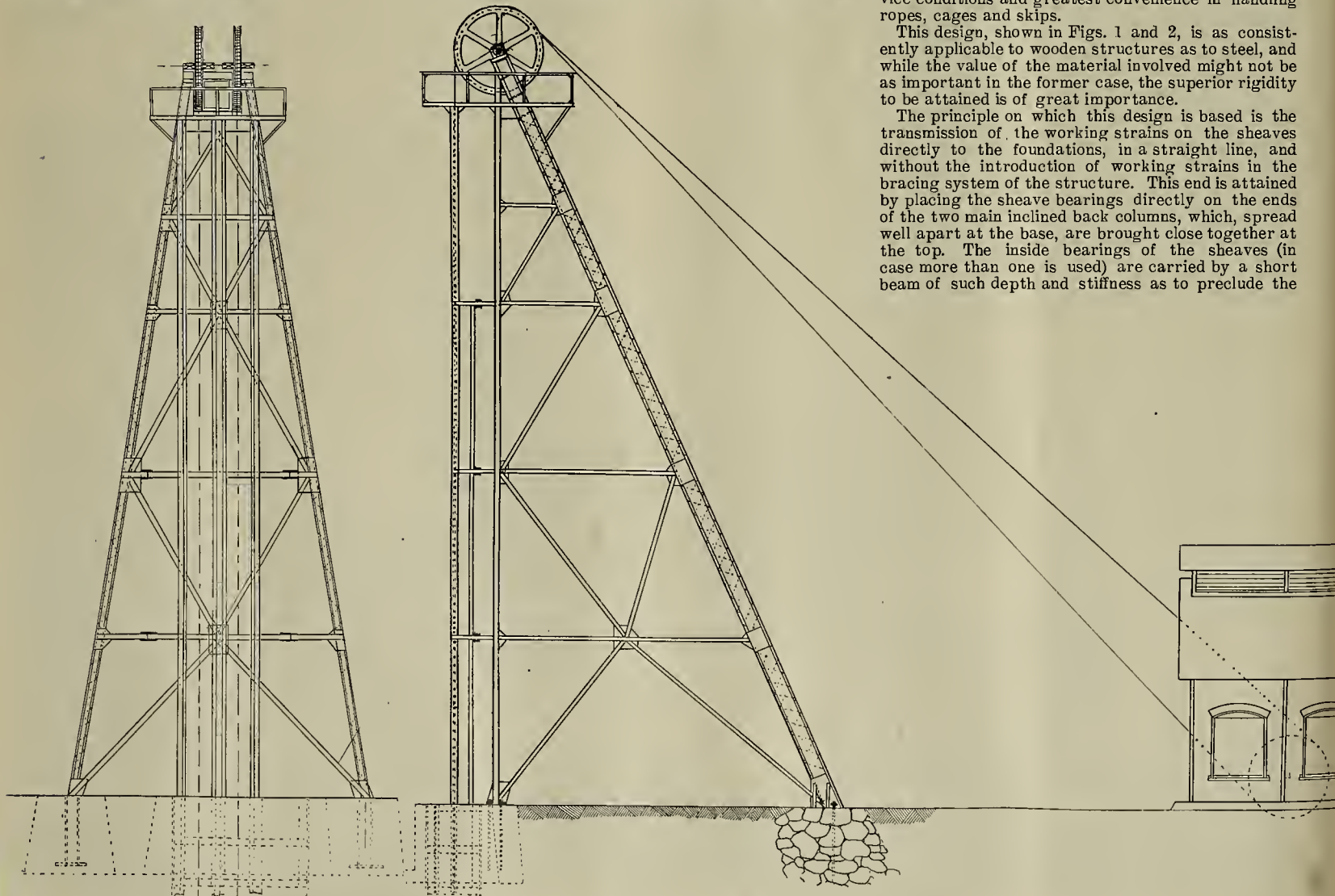


Fig. 1.

Fig. 2.



possibility of even the slightest deflection under load, this beam being carried in turn by the hack columns and made as thoroughly an integral part of these columns as possible.

The back panel of the head frame, consisting of the two main inclined columns, the connecting beam at the head, and the lateral bracing system arranged in as many subdivisions as are demanded by the dimensions of the structure, forms the principal compression member, and through it, in fact, practically all working strains are transmitted to the foundation direct, as this back panel, considered as a single compression member, is placed near the line of the mean resultant of the working strains on the ropes, its actual position being always a little outside this line, toward the hoist.

If the panel is properly proportioned for the loads to be carried, and each back column designed to resist the compressive strains that it will be subjected to in practice, with whatever factor of safety is considered desirable, all the rest of the structure may be relatively very light indeed, as the purpose of stability may be served by a bracing system of such strength only as to resist that part of the weight of the back panel, sheaves and platform due to the inclined position of the back of the frame. The guide posts (which, by the way, the writer strongly recommends be timber in any case), serving as a support for the guides for cages or skips, may be bolted to suitable struts as indicated in the figures, and will not call for very heavy support, as there are no lateral strains on the guides where self-dumping skips are not used, and even in this case the strains, if intelligently resisted, are not necessarily at all serious in their nature.

The writer first developed the principles of this design in the early part of 1899, and as a matter of fact foreshadowed its publication at the time the previous article on steel head frames was written. (See MINING AND SCIENTIFIC PRESS, July 22, 1899.) No attempt has been nor will be made, on the part of the writer, to take out a design patent covering the principle of the head frame illustrated, but in this connection attention is called to the fact that a patent was issued a year or so ago to a German engineer, on a head frame embodying the same principles. However, as the writer's own sketches and designs based on this principle have been freely shown and used for a number of years, the value of the German patent would appear to be nil.

The economy of material in the design of a head frame, where the principles laid down are observed, may easily exceed 30% in the case of a steel frame as compared with one designed on conventional lines, and this may be exceeded where wood is the material used, as that part of the structure supporting dead weight alone or serving the purposes of stability may be relatively very light and may safely be spiked together instead of bolted.

One final remark is ventured. In no case should the heads of the columns be farther apart than necessary, and on no account should the posts be vertical, except those in front, as shown in the side elevation of the frame (Fig. 2). Only by the retention of the pyramidal form of the structure as a whole can it be mathematically consistent and actually stable. So long, however, as the principles illustrated are not departed from, and intelligent care is used in the proportioning of the main members of the structure, practical results of a highly

satisfactory nature may be anticipated with confidence, both as regards low first cost and satisfactory service under working conditions.

### Rapid-Economy Stamp Mill.

Less than two years ago G. C. Richards of Oakland and San Francisco, Cal., produced his "camless" mill—"Richards' rapid-economy stamp mill"—the fruit of

as with any mill, but the shoes and dies have to be renewed more frequently on account of the greater amount of crushing they are designed to do. The recoil of the blow is taken up by the locomotive steel springs on the stamp stems. These springs are also designed to defer the crystallization of the stamp stems to a great extent; but, in case a stem does break because of crystallization, it is reversible."

The present type of this mill is a battery of three (and multiples of three) 800-pound stamps with 8-inch shoes and dies. The manufacturers say that these stamps crush six to eight tons to the stamp through a 40-mesh screen in twenty-four hours with but 4 H. P. to each stamp.

These mills are being built by the Rapid-Economy Stamp Mill Co. of San Francisco, Cal., with head offices at 601-2-3 Examiner Bldg. of that city.

### THE PROSPECTOR.

The ore from Elk City, Idaho, is illmenite, also called menaccanite (titanic iron), in what appears to be a pegmatitic granite.

The two rock specimens—No. 1, white, flat and streaked with violet colors, and No. 2, speckled with small dark red spots—are tuffs. In their present condition they may be called claystone.

The ore from Battle Mountain, Nev., is dense siliceous rock, probably an altered felsite or other intrusive rock, containing a considerable amount of arsenical iron sulphide. The yellowish green stains are the result of the decomposition of this mineral.

The rock specimen from Sonoma, Cal., is a typical trachyte. It contains abundant phenocrysts of sanadine (glossy feldspar), the characteristic feldspar of trachytic rocks. Ore deposits and mineral veins sometimes occur in rocks of this description.

The rock specimen from Cedar Creek, Idaho, marked No. 1 is hydro-mica schist, in which there have been developed innumerable very small crystals of tourmaline. The rock may be called, then, "mica-tourmaline schist." A small amount of graphite is also present.

The mineral from Pearce, Ariz., is a combination of lead and antimony, probably zinkenite. The composition of zinkenite is sulphur 22.3, antimony 41.8, lead 35.9. Arsenic sometimes replaces part of the antimony. The ore contains no molybdenum. There is no zinc in zinkenite, and there are several minerals which closely resemble it. Among these are andorite, jamesonite and dufrénoyite. These minerals all differ slightly, chiefly in crystallization, but have about the same color, streak, specific gravity, and approximately the same composition.

The mineral specimen from Carson City, Nev., marked F. A. M. is tourmaline, a silicate of iron, magnesia and manganese, with several other elements. The composition of tourmaline is variable. This variety (the black) has no value. Pink, green and some other colored tourmalines, when transparent and without flaw, are valuable as gems, and are used for that purpose. Gem tourmalines are found in at least three localities in California, viz., Pala, Hemet valley and Mesa Grande, in the southern part of the State.

The rock specimens from Hood River, Or., are: No. 1, a much altered eruptive rock, in which there is considerable green iron silicate. No. 2, amygdaloidal lava, with considerable iron silicate, with some zeolites. No. 3, also a green-stained fragment of lava. The white rock in No. 3 is chalcedony, a form of silica deposited from solution in a cavity. No. 4 is andesite, in which are numerous crystals of a translucent mineral showing brilliant "schillerization"—that is, a bright play of colors, green, golden and blue. This mineral is olivine. Nos. 5 and 6 are sands containing a large amount of magnetite. No. 7 is basaltic lava. The white in No. 7 package is semi-pal. No. 8 is basalt.

### Deep Mining in Victoria.

The Town and Country Journal gives the following brief description of the latest operations at the New Chum Railway mine, Bendigo, Victoria, the deepest mine in Australia: "Gold has been seen in the center-country winze, below the 3856-foot east cross-cut at the New Chum Railway, which has a total depth of 4152 feet. This winze has now traversed stone on the east side for a distance of 12 feet, and the bottom of the winze is going down, all in quartz. It would appear that the winze has been sunk through a neck of stone, and that operations are now proceeding in the cap of a formation. In the bottom of the winze on the east side the stone, which higher up was very white, is improving in appearance and is now of a streaky character, and shows a little mundic. Only one color of gold has as yet been seen in the deep winze, but it is unique as being the deepest gold found in the southern hemisphere."

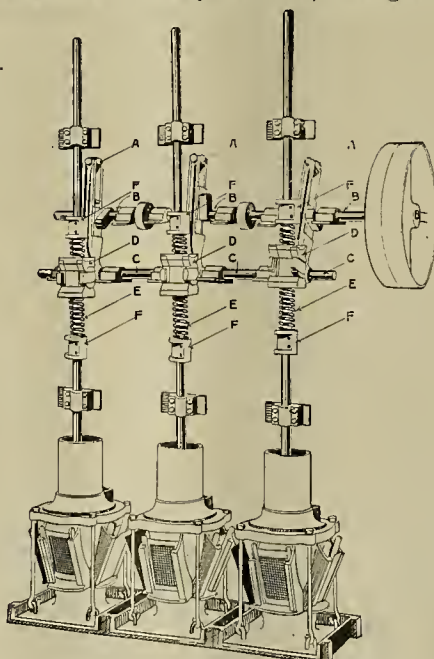


Head Frame High Ore Mine, Butte, Mont.

many years' labor and observation, which, it is claimed, is founded on the principle of leverage. In place of the cam is substituted a lever with a purchase of 4 to 1, which intent is to operate the Richards' mill with one-half the power required by a gravity mill. The levers are actuated by a crank shaft revolving with sufficient rapidity to cause the stamps to strike 200 to 250 blows per minute. By this combination it is claimed that 1 H. P. suffices for each stamp.

Mr. Richards asserts: "My mill bears the same resemblance to the cam mill that the latest style automobile does to the early stage coach. The good old stage was all right for its time; but it was slow, uncertain and expensive. The cam mill does only half the work with twice the power required by my mill—and with my mill there are no doubtful results. Those heavy, hammer blows, striking at such a high rate of speed, crush anything in the way of ore, no matter how hard it is."

This mill has individual mortars (Mr. Richards' patent), are circular in shape, each mortar having a screen surface of 480 square inches, making a total



Rapid-Economy Stamp Mill.

of 1440 square inches to a battery of three stamps. Each stamp, besides having its individual mortar, has its own automatic feeder and water supply.

"The screens wear evenly and last about as long



## Examination and Valuation of Mines.\*

No. IV—CONCLUDED.

**WEIGHT OF SAMPLE.**—The weight of the sample broken down will vary with the width and hardness of the ore. When it is larger than the capacity of the sample bag, the sheet must be carried to a convenient place underground and its contents broken down to the size of a walnut. When this has been done, the sample is thoroughly mixed, formed into a very flat truncated cone and quartered.

Two opposite quarters are rejected, being removed completely with all their fines from the sheet. The material in the two remaining quarters is then broken down to a size half the diameter of a walnut, thoroughly mixed, and again quartered. The two quarters lying in the position of the two quarters retained in the first operation are rejected and removed from the sheet.

A common method of mixing the ore on the sampling sheet is to toss the material from one side to the other. In this process care must be taken to insure that the fines are not concentrated in one particular part of the sample, but evenly distributed throughout the whole mass before each quartering.

In three quarterings, a sample weighing eighty pounds will thus be cut down to ten pounds, which is about the maximum capacity of your sample bags.

The time required to break down a sample will depend upon the hardness and size of the lode. It seldom is less than half an hour, and may extend to several hours, depending upon the number of quarterings needed to reduce the sample to a convenient weight. The sampling of a large mine may occupy several weeks and run into a cost of several hundred pounds.

**ASSAY OF SAMPLES.**—The whole of the sample should be dried, crushed in a rock breaker in the laboratory to pass through a 10-mesh sieve, mixed and sampled by quartering till reduced to a pound or two in weight, all of which should be finely pulverized, passed through a 60-mesh sieve, again mixed, and divided into two portions. One portion is handed to the assayer, while the other is retained as a duplicate sample for subsequent reference and verification if the necessity should arise.

Carelessness in the laboratory may stultify all the care exercised in the sampling underground.

If the mine examiner submit his samples to an assayer whose qualifications are unknown to him, he should take care to be present during the crushing, pulverizing and final division of the assay samples.

The duplicate samples should be put into small calico or stout brown paper bags, labelled and secured in a lock-up sack, which should be removed from the laboratory.

The examiner's samples should never be submitted to the mine assayer; and only in very exceptional circumstances should the samples be placed in the hands of an unknown assayer.

**CALCULATING AVERAGE WIDTH AND VALUE OF VEIN.**—The assay values may be expressed in pennyweights of gold per ton; percentage of metal; or, in the case of low-valued gold or bullion, the money value may be stated in dollars, or pounds, shillings and pence per ton.

The thickness of the ore is most conveniently expressed in inches for veins up to 8 or 10 feet thick. Take the case of ten samples from a gold-bearing vein as follows:

No. of Samples.	Width of Vein in Inches.	Assay Value Per Ton in Pennyweights.	Inch—dwt.
1	40	8	320
2	36	9	324
3	32	7	224
4	34	5	170
5	28	9	252
6	30	6	180
7	34	8	272
8	38	5	190
9	40	7	280
10	44	4	176
Totals	356		2,388

The average width is found by dividing the sum of the widths by the number of samples. Thus in this case we have  $\frac{356}{10} = 35.6$  inches average width.

The average assay value is found by dividing the sum of the inches-dwt. by the sum of the widths as under:  $\frac{2,388}{356} = 6.69$  dwt. per ton for a width of 35.6 inches.

**EXCEPTIONAL ASSAY VALUES.**—A sample giving an exceptional assay value may be dealt with in different ways. It may be discarded entirely and not included in the average; or ascertain the average value with it included, and replace the original exceptional value by this average, and then calculate the average value for the average width.

For example: Five samples gave values of 10 dwt., 20 dwt., 25 dwt., 120 dwt. and 25 dwt. per ton. The average is 40 dwt. Replace the exceptional value, 120 dwt., by 40 dwt., and then proceed with the calculation of results.

The exception value may represent a small patch of rich ore, or a bunch of rich ore increasing in dimensions going upwards or downwards, or even a solitary speck of gold. The most satisfactory manner of

dealing with an exceptionally rich assay from a sample is to resample the vein a second time.

**FUTURE PROSPECTS.**—When satisfactory values have been obtained around a block of ground, the natural inference is that the area of ore is of the same approximate value. Experience has shown that where a block is exposed in four dimensions such inference is fair and reasonable. Where the block is exposed in three dimensions the inference may be open to some doubt.

Before arriving at a definite conclusion as to the future prospects of the mine it is advisable for the examiner or mining engineer to carefully consider the following questions: (a.) Is there any change of rock formation enclosing the lode in any part of the mine? If so, what influence does this change of country exercise upon the value of the ore? (b.) Is there any indications of barren zones of ore, either in depth or horizontal extension, along the course of the lode? (c.) Are the values in the zone of oxidation likely to be maintained in the unoxidized portion? (d.) What are the probabilities of impoverishment in depth?

**SAMPLE VALUES AND MILL RETURNS.**—Manifestly the assay values obtained represent only the values of the actual material broken by the examiner. The variations of value obtained at the different intervals clearly emphasize the variable value of the ore. Hence the mean values deduced from the assay values can only be regarded, even in the most favorable cases, as close approximations.

A mining engineer with a personal knowledge of the ore and values in a mine extending over a considerable period can often so adjust his averages by the experience of the past as to make a very close estimate of the quantity and value of ore in newly developed ground in the same or adjoining mines.

The discrepancy that often exists between the sampler's estimate and the mill returns, in the case of gold ores particularly, may be due to one or several causes, among which the following may be enumerated: (a.) A sudden increase of width of ore without a corresponding increase of values. (b.) A sudden decrease in values, or the payshoot may split into two legs and reunite between two levels. (c.) A greater proportion of mullock or rock is sent to the mill than was contained in the examiner's samples. This is a contingency very liable to occur in the breaking of a narrow vein in the stopes, especially where the vein is less in width than the width of the breast or face. In cases where the walls of the vein are well defined and the stripping easy, the proportion of rock introduced with the ore is not likely to be very great, especially where a stretch of ore is stripped before it is broken. (d.) Imperfect tally of the tonnage of ore sent to the mill. (e.) Inadequate allowance for moisture.

The sampling of a mine for valuation purposes is most exhausting, both physically and mentally. When the work has been carried out carefully and conscientiously the mine examiner should be prepared to stand by his results.

The examiner must remember that he is the confidential adviser of his principals, and for that reason must keep a discreet silence about the results of his examination, and of his opinion as to the probable value of the mine.

**SAMPLING OF DUMPS OR PADDOCKS OF ORE.**—The stack of ore is divided into a number of small blocks by two systems of cuts or trenches passing through the ore at right angles to each other.

(a.) Each block can now be sampled separately by picking pieces of ore from its four sides.

(b.) Or the material excavated from the trenches can be wheeled to a clean piece of ground, spawled into small pieces, mixed, and quartered repeatedly until a sample of convenient size is obtained. Before each quartering the larger pieces of ore must be broken to half their diameter in the preceding quartering.

(c.) Or the material from the trenches can be crushed in a rock breaker, mixed, and quartered down till the assay sample is obtained.

**SAMPLING HEAPS OF TAILINGS.**—If the accumulation of tailings is large it should be sampled in separate sections, as large piles of sands are liable to vary considerably in value in different parts.

Stake off the heap, so as to divide it into sections about 5 yards square. Make a diagram in field book corresponding to sections. Record the dimensions of the sections, and distinguish each section by a letter, as A, B, C, etc.

Sample each section, beginning with section A: (a.) With a sampling iron take samples all over the section at, say, every foot or two. (b.) If there is reason to believe that the values are not the same from top to bottom, put the top material into one bag and the lower into another; or, if necessary, separate samples can be taken for every foot of depth. (c.) If there is no sampling iron available, holes are dug at intervals of every 4 feet or 6 feet. The sands from the holes are wheeled to a clean place, mixed, and reduced by quartering to a convenient size.

If required, the sand obtained from different depths can be kept separate.

**SALTING OF MINES.**—By "salting" is meant the illegal enrichment of the ore, with the object of giving the property a fictitious value. The mine ex-

aminer should be familiar with the methods adopted by unscrupulous persons, so as to be able to protect the interests of his principals.

A common method is to tamper with the examiner's samples; and for this reason the samples should always be in safe custody until the assay samples are known.

Cases are known where the sample bags have been enriched before the samples were put into them. It is therefore a wise precaution to keep the sample bags in a lock-up sack until they are required. And even then it is advisable to turn each bag inside out and shake vigorously before use.

In the case of gold mines soft ore has been artificially enriched to a depth of a foot or more with a strong solution of chloride of gold. Fraud has been practiced on mine examiners by stretches of rich ore having been skillfully built into the wall of a level at different intervals and at the working face, the joints being obscured by liberal splashes of mud. In the same way artificial outcrops have been prepared.

Dumps of ore have been stacked with rich ore on the sides and top surface. An imposture of this kind is at once disclosed by the process of trenching when procuring samples for assay.

Samples of gold wash intended for examination by panning have been enriched, either before or during the washing, by the agency of gold-bearing tobacco ash, pellets of clay and gold-bearing finger nails. The gold obtained from the panning of gold wash or tailings should be examined under the microscope.

Bulk samples of ore have been salted during the process of treatment in the battery, either by the addition of gold or amalgam.

The examiner's samples may be unlawfully enriched at any stage from the breaking of the material in the mine to the assaying in the laboratory. Strong solutions of gold chloride have been injected into the bags with a syringe and gold dust added to the litharge and fluxes. Fraud is so easily practiced in this stage that the examiner should either supply his own assay materials or test those placed at his disposal.

In these days of mine valuation by systematic sampling, cases of stacking or salting of the ore in the mine are rare, and easily circumvented by the watchful examiner. But, besides covert acts intended to beguile, the examiner may be misled by the suppression of important developments, or by the blocking up of workings where unfavorable results might be obtained.

On his part the mine examiner must take care not to assume an attitude of restraint and distrust towards those connected with the management. In the writer's experience, miners are as honest as most men; and if they sometimes put the best side before you it is more from a feeling of loyalty to their employers than a deliberate desire to deceive. Probably not more than one in a hundred would willfully mislead you, or use unlawful means to enrich your samples. But the hundredth man is generally a clever rogue and needs very close watching; and because of this one man you must take no risks, either in the mine or in the laboratory.

## Duty and Authority of Forest Rangers.

The following communication was received some weeks since from a claim owner in Fresno county, Cal.:

TO THE EDITOR:—I own four placer claims in the Forest Reserve and am working them nine months out of the twelve each year. My assessment work affidavit is on record for last year in Fresno. I make one report to the United States Mint and one to Charles G. Yale yearly. Now a Government ranger comes along and wants me to give him a report of how much my mines have produced, and further says if I don't give him the report he will put me out of the reserve. I shall not give him any such report, and I wish you would kindly inform me through "Concentrates" if there is any law to compel me to give it. I always consider what you say final.

Toll House, Cal., May 18.

This matter was referred to the Commissioner of the General Land Office at Washington, D. C., in the belief that possibly some new regulations had been issued which gave forest rangers the authority the above communication would suggest they had in such matters. Following is the reply of the Acting Forester:

TO THE EDITOR:—I have received your letter of May 11, 1905, by reference from the Commissioner of the General Land Office.

The forest ranger you refer to was doubtless making his proper official inquiry in regard to the character of the mining claims and the compliance with the law by the applicants. The forest ranger has no authority to threaten a person or to put him off the reserve for refusing to give information. He has no authority to remove a claim holder from a reserve without due process of law; but the law gives him authority to make arrests for the violation of the laws and regulations relating to the forest reserves and national parks. A miner, acting properly, is as secure in his mineral possessions in a forest reserve as though he were on any other portion of the public domain.

No recent regulations have been issued concerning mining in forest reserves.

OVERTON W. PRICE,  
Washington, D. C., May 25. Acting Forester.

\* Prof. Jas. Parks in N. Z. Mines Record.



# Spitzluten.\*

Written by H. LEUPOLD.

During the discussion on Mr. H. S. Denny's paper in October, 1903, I criticised in passing the spitzluten in general use on the Rand, and some of my friends have since been inquiring whether I had anything better to offer.

As the subject is attracting a good deal of attention in connection with tube mills, I think the following description of a spitzlute I made for the Treasury and now in use there in triplicate since July last may prove interesting.

As shown by Figs. I to V, this is a modification of

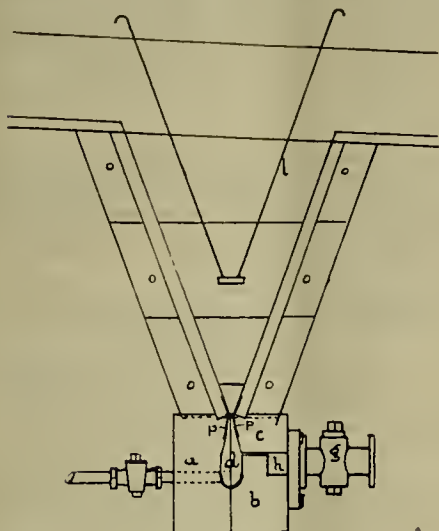


Fig 1

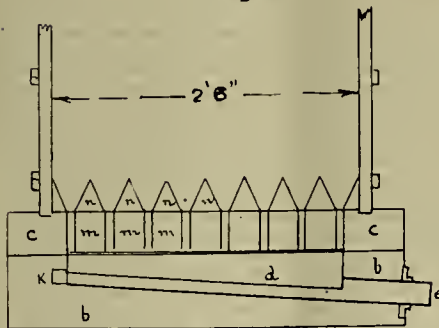


Fig 2

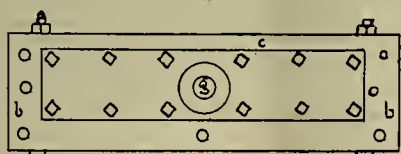


Fig 3

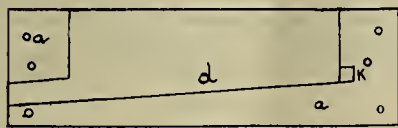


Fig 4

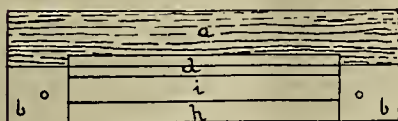


Fig 5

the Bilharz spitzlute, but built of redwood, as cast iron is easily worn by coarse sand under water. The wood is treated with boiling linseed oil until it will take up no more. The foundation consists of three solid blocks, a, b, c, each 3 feet 3 inches long, in which the channels and slots required are easily cut. These blocks, when assembled on white lead joints and bolted together, form a single block 11 inches by 11½ inches by 3 feet 3 inches. The main vertical slot is 2 feet 3 inches long and ¾ inch wide, being protected at the upper entrance by two ¼-inch steel plates, p, p, bent to the required angle and simply screwed on from above. This slot widens downward to 2 inches and there forms the channel d, sloping to the discharge orifice. A 2-inch pipe, 3 inches long, of which one-half is cut off lengthwise for 2 feet 3 inches, as shown, forms the bottom of the channel d, and also

the discharge end e, which protrudes slightly. It is threaded for screwing on a flange and the coupling to gooseneck. The coupling should be a T with wooden plug for sluicing out. The clear water is admitted through a 2-inch pipe and cock, g, into a square chamber, h, from where it passes through a horizontal slot, i, ¼ inch wide and running the whole length of 2 feet 3 inches into the vertical slot and chamber, d. Another small chamber, k, receives clear water through a 1-inch pipe and cock for flushing out purposes. The baffles consist of single ¼-inch steel plates, l, l, running in grooves formed by screwing 1-inch by ¼-inch slats to the vertical sides of the spitzlute. There are several of such grooves, and a little iron cleat prevents the plates from dropping too far. The chamber, h, is closed on the outside by a 1½-inch plank screwed on, and to this the cock flange is screwed in its turn. The main vertical slot being ¾ inch by 2 feet 3 inches, offers an area of over 10 square inches, and this would require a stream of clear water far greater than desirable. In the Bilharz spitzlute such slot is ¼ inch wide, with parallel sides, and invariably chokes up in a short time by coarse gravel lodging in it. To reduce the area of this slot in my spitzlute, I block it with seven wooden wedges 3 inches by 4 inches by ¾ inch to 1 inch thick, spaced ¾ inch apart, thus forming eight discharge slots ¾ inch by ¼ inch, having a total area of only 2 square inches.

The concentrates are guided to these openings by seven small wooden tetrahedrons, n, having their lower edge truncated or flattened ¼ inch and nailed in position. The sides of these tetrahedrons are about 3½ inches long.

The purpose of the two inclined side planes of the central hole spitzlute is thus attained, but whereas in the latter these form a single inverted pyramid bottom of great depth, causing strong eddies and rendering close classification impossible, the eight small funnels, only 3 inches deep, do not interfere with the regular flow of the pulp stream over the whole width of the spitzlute, and perfect classification is obtained.

I will conclude by giving results obtained from an average of many samples, both of concentrates and overflow.

Passed through mesh per lineal inch.	Remained on mesh per lineal inch.	CONCENTRATES.			OVERFLOW.		
		%	dwt. per ton.	Gold Value %	%	dwt. per ton.	Gold Value %
17	40	63.67	6.22	43.41	6.31	4.3	5.49
40	60	28.81	12.60	39.79	10.41	4.5	9.48
60	80				5.03	4.83	4.93
80		7.52	20.42	16.80	78.25	5.06	80.10

It will be seen that the concentrates consist of 63% coarse sand of low value, a middling product, and of 7½% fine pyrites of over 20 dwts. There is no slime, and the water is quite clear. The overflow contains only fine sand of 4½ dwts., and all the slime.

There are four separate means of regulating the work of this spitzlute—

1. Altering the width of main stream by changing baffle plates, l, l, in the various grooves.
2. Varying admission of clear water at g.
3. Varying admission of clear water at k.
4. Raising or lowering gooseneck discharges which pivot around the T couplings at e.

I find that a head of water of 9 inches is sufficient on the discharge orifice, by which a head of over 3 feet is gained, as against the ordinary spitzluten, where the discharge is below, and controlled by an ordinary throttling cock. The construction described can easily be adapted to a sands and slimes separator, where but little, if any, clear pressure water would be required, and the advantage of saving 3 feet in the diameter of a large tailings wheel is too obvious to require insisting on.

## Production of Talc and Soapstone.

The total production of talc and soapstone of all varieties during 1904 was 91,189 short tons, valued at \$940,731. As compared with 86,901 short tons, valued at \$840,060 in 1903, this is an increase of 4288 tons in quantity and of \$100,671 in value, due partly to a general increase in the production of talc from all States, but principally to the large increase in the production of fibrous talc in New York. In 1903 there had been a large decrease in the production of fibrous talc in New York as compared with the production of 1902, which was due to long-protracted strikes at some of the paper mills.

Of the 1904 production, 27,184 short tons, valued at \$433,331, were obtained from all the States exclusive of New York. This value includes that of the manufactured product made from the talc, as only a small quantity of the product is sold in the crude state. The production came from nine States, and these, together with the number of producers in each, were as follows: California, 1; Georgia, 2; Massachusetts, 1; New Jersey, 1; North Carolina, 5; Pennsylvania, 2; Vermont, 3; Virginia, 2; Washington, 1—a total of eighteen producers.

## Personal.

F. A. DE COSTA of Goldfield, Nev., has been in San Francisco.

CHAS. COLCORD has charge of the Willey mill at Kokomo, Colo.

CHAS. TAYLOR has charge El Oro Co.'s mines at Poza, Sonora, Mexico.

JAS. KLEGG is manager San Martin mine at Uruachic, Chihuahua, Mexico.

J. C. WAGGONER is general manager H.-Y. mine, near Roosevelt, Idaho.

H. R. KING, of Grand Rapids, Minn., is examining mines near Placerville, Cal.

C. J. BAKER of Davenport, Ia., has been examining mines, near Rochford, S. D.

T. B. CROW is metallurgical engineer Colorado-Oregon M. Co., at Bohemia, Oregon.

D. DRISCOLL is superintendent Keane Wonder Extension M. Co., near Ballarat, Cal.

BENJ. MARTIN has been appointed superintendent Beta mine at Iron River, Mich.

J. W. NEILL has retired from the superintendency of the Heinze mines in Butte, Montana.

C. M. FUELLER, of Denver, Colo., has charge of work on the Northrop mill, at Silver Cliff, Colo.

A. HOSKINS, of Silver Cliff, Colo., is in New York City financing his mining properties.

H. C. GRIGSBY has gone to Nome, Alaska, to become assistant superintendent Ophir mine.

E. A. JULIAN has been appointed superintendent mill at Florissant, Teller county, Colo.

L. W. SHINN has resigned as superintendent Utica mine at Angels, Calaveras county, Cal.

F. W. DENTON has succeeded L. L. Hubbard as manager Champion M. Co. at Painesdale, Mich.

D. S. COCHRANE, superintendent Jerome Copper Co., at Jerome, Ariz., has been in Pittsburg, Pa.

G. A. SCHROTER, a mining expert for the Venture Corporation of London, is in San Francisco.

F. W. BRADLEY of San Francisco, Cal., has been elected president Federal M. & S. Co. of Idaho.

F. G. FARISH has returned from Sonora, Mexico, and is at present examining mines at Telluride, Colo.

D. A. HERRON, superintendent Tomboy mine, has returned to Telluride, Colo., from a visit at Helena, Mont.

G. H. SAMPSON, vice-president Rand Drill Co., New York, has returned there from a trip to the Pacific coast.

A. H. BUCK of Denver, Colo., has been appointed superintendent Panuca mine, near Monclova, Coahuila, Mexico.

E. N. WALKER of Soulsbyville, Cal., has been appointed superintendent Big Conqueror mine, near Goldfield, Nev.

F. S. WILHELM has been appointed general manager Arizpe M. Co., near Cananea, Sonora, Mexico, succeeding J. P. Hallihan.

J. H. ROGERS has resigned as superintendent Velardena smelter at Torreon, Chihuahua, Mexico, and is in New York City.

D. M. RIORDAN of New York, managing director Bully Hill Copper M. & S. Co., is at the mine at De Lamar, Shasta county, Cal.

J. W. FINCH has been appointed superintendent Last Dollar mine, Cripple Creek, Colo., in place of Chas. Walden, who has resigned.

R. B. LAMB has resigned as manager Great Tower Hill mines, Leonora, Western Australia, and is returning to the United States.

W. S. HEGER has resigned as manager San Francisco office Westinghouse Electric & Mfg. Co. W. W. Briggs is present acting manager.

T. C. ARCHER of Prescott, Ariz., has been appointed superintendent Oregon Securities mine at Bohemia, Or., vice C. C. Matthews resigned.

C. G. WARE of Roubaix, S. D., has gone to Bluefields, Nicaragua, as electrical engineer for the Lone Star M. Co., of which A. G. Smith is manager.

HERMAN SCHUSSLER, chief engineer S. V. Water Co., San Francisco, Cal., has been appointed consulting engineer to the Isthmian Canal Commission.

W. G. LELAND and S. S. MOORE, vice-president and secretary Relief G. M. Co., have returned to New York City from a visit to the mines near Phoenix, Ariz.

W. H. MEAD, of Spokane, Wash., has charge of developing the Metaline M. & S. Co.'s silver-lead mines on the Pend d'Oreille river, Stevens county, Wash.

E. H. SNIFFIN, general sales manager Westinghouse Machine Co., East Pittsburg, Pa., was in Denver, Colo., the past week attending the Electric Light Convention.

C. H. CUTTING, of the Troy-Manhattan Co. at Troy, Ariz., has resigned as general manager and been promoted to assistant to the president, with headquarters in New York City.

DR. FRANKLIN R. CARPENTER, who built the Deadwood & Delaware smelter at Deadwood, S. D., has been engaged to take the management of the Tinton properties at Nigger Hill, in western Lawrence county, S. D.

\*Jour. Chem., Met. & Min. Soc., S. A.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

### ALASKA.

B. S. Revett of Denver, Colo., is at Nome putting up a \$100,000 dredger with a capacity of 300 H. P., and later he goes to Fairbanks, where he is building a 70-mile ditch that will be high enough to throw water upon every creek, into every gulch and upon every bench in the Tanana district. A. E. Murphy has charge of the work. The dredger hull at Nome will be 115 feet long, 36 feet beam and 7 feet deep, and will weigh 500 tons. It is expected to be running by September 1.

T. H. Ellis, general manager of the Windfall placer claim on Windfall creek, 15 miles northwest of Juneau, asserts that in sinking through the gravel for a hydraulic lift, the gravel that came out of the hole when washed averaged \$5 to the yard.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The shaft of the Shattuck Arizona C. Co., near Bisbee, continues in good ore. This is equipped with an 80 H. P. hoist and is down 732 feet. T. Bardon of Wisconsin is president, M. Pattison of Duluth, Minn., vice-president, A. M. Chisholm of Duluth secretary and treasurer, and L. C. Shattuck of Bisbee managing director. Their property consists of six claims south of the property of the Copper Queen. Bisbee, June 5.

#### Gila County.

E. F. Eisenhour is driving a tunnel on the Rye C. Co.'s property in the Mazatzal mountains, near Globe, to cut the main ore body at a depth of 500 to 600 feet. The tunnel is in 200 feet and will be driven 500 feet farther to cut the ledge.—The output of the Old Dominion smelter, at Globe, for May was over 3,100,000 pounds of blister copper, which is the largest production for any one month in the history of the company. The furnaces were in actual operation twenty-nine and one-half days and for twelve days of that period were operated with reduced blast, while the large blower engine was being remodeled. There was run through the furnaces 38,000 tons ore, slag and lime rock.—The Arizona Commercial Copper Co.'s new 150 H. P. hoist and compressor are in service at the Copper Hill mine, near Globe.—At the Black Hawk the shaft is down 100 feet.—It is reported that the Arizona-Colorado M. Co., working 3 miles north of Globe, intends to put in a 100-ton smelter. R. M. Force is president and J. L. Alexander of Globe resident agent.—The Globe-Boston C. Co. has bought the Mallory mines, 2 miles north of Globe.

#### Graham County.

The Shannon Copper Co. at Clifton have a contract with Wm. Damron for the delivery of sixty tons of lime rock daily from Limestone canyon. The lime rock will be used in the furnaces for fluxing purposes.—During May the Standard copper mines at Clifton shipped fourteen cars of ore. The lowest returns on the second-class ore was 15.90%, and the highest of that class 20%. Two shipments of first-class went 40% and 46.84%. This ore is coming from the lowest workings of the mine.

#### Maricopa County.

Work has been temporarily stopped at the White Gold mine, near Wickenburg, awaiting the arrival of hoisting machinery and building of a tramway. The road from Martinez has been put in good order.

#### Mohave County.

J. Brockman has leased and bonded the Azalia mines from H. E. Petet and co-owners, who will operate them on the Gold Road basis of work. The mines are 12 miles west of Mineral Park, which is 9 miles from Chloride.—The new Blue Ridge milling plant, in the San Francisco district, has begun the treatment of ore.—The Gold Road Co. at Acme is putting in a filter press at the mill. At the mine a 16-drill compressor is being put in.

The Arizona-Mexican M. & S. Co. has made a rich strike in the Twin mine, at Cerbat. The new ore body was opened up in the shaft, which is now down 70 feet and is being sunk under a 100-foot contract. The ore carries good values in gold and lead.—H. Lang is taking rich gold ore from his Tragedy mine, at Union Pass, near Kingman.—A rich gold discovery is reported from the Vanderbilt mine, at Vivian, where a 10-inch vein of ore has been found in the drift on the 175-foot level. The mine is being worked by the Cerbat Mountain M. Co., of which J. Boyle, Jr., of St. Louis, Mo., is general manager.

#### Pima County.

(Special Correspondence).—The Imperial C. Co., operating near Silver Bell, is shipping 100 tons daily to the smelter at Douglas. During the last fifteen months 12,000 feet of underground work has been done. A large boiler is put in at the old Union shaft, preparatory to starting work through this opening. A 10-ton experimental concentrating plant will be put up at once and the necessary machinery to permit of the use of crude oil fuel in place of coal will also be added.—The Gould C. M. Co. has nineteen claims on the northwest slope of the Tucson mountains, 15 miles from Tucson. S. H. Gould is president and W. H. Dailey secretary. The Gould property is developed by 400 feet of work, one shaft being sunk 120 feet. A 15 H. P. gasoline engine is in use and a compressor will be put in soon. Tucson, June 5.

#### Pinal County.

The Mineral Hill Con. M. Co., with mines in the Xavier district, has blown in its furnace and is shipping matte to the Copper Queen Co. at Douglas. A steam hoist and four whims are taking ores from five shafts of the mines. Another furnace is soon to be blown in, and another is to follow later.—In the Mineral Creek district the Big Lead M. & S. Co. is making a test run of

500 tons of copper ore in the Bob Tail mill, which the company has leased. It has also ordered a 100-ton concentrating plant, and expects to buy the mill and begin active operation soon.

Manager Sharpe of the Arizona Pacific M. Co. reports that he has the mines unwatered at Wooley and sinking the shaft has been resumed.—The Memania claims, between Ray and Kelvin, have been bonded to St. Louis men, who will develop them.

#### Santa Cruz County.

The Arizona Development Co. is preparing to work properties near Harshaw.—The Presidential mines in the Santa Rita mountains are receiving new pumps preparatory to development.

#### Yavapai County.

(Special Correspondence).—The Crown King M. Co. at Crown King started in concentrating its tailings May 20 and are now milling 70 tons daily. There are over 300,000 tons on the dump. Crown King, June 5.

(Special Correspondence).—Ground will be broken July 1 for the new Val Verde smelter at Val Verde to replace the one destroyed by fire a year ago. The Arizona Smelting Co. has its engineers on the ground and its plans for the new plant are perfected. It is said that the new smelter will cost about \$1,000,000. It will be built of steel and will have a capacity of 600 tons of ore a day. Suitable laboratory, office buildings, workmen's quarters and mess rooms will be built. Val Verde, June 5.

(Special Correspondence).—The recent cave-in at Jerome is less serious than at first thought. The United Verde resumed operations almost immediately. They plan improvements to be put in at once. The company will make a 40-foot addition to its smelter, put in another 500-ton furnace, a 50-ton crane and two converters. There will also be put in a Weiss condenser capable of condensing 3000 gallons of water from steam from engines per hour; a large cooling table, which will do away with the large flume running along the south side of the road leading to the depot; two new marine boilers, two pumps and a large blower with a capacity of 400 cubic feet per revolution, with special engines to handle it.—The management of the Copper Chief mine at Jerome has decided to retimber the property throughout, which means an expenditure of about \$30,000. This is necessary, as the timbering got in bad condition while the mine was shut down. It is reported that the control of the property has recently changed hands, and this new timbering is preliminary to the active starting and working of the property. Jerome, June 5.

The Cumberland mine at Crown King has resumed work with air drills.—E. A. Haggott, superintendent of the Blue Bell, near Prescott, says that the main shaft is down 500 feet. Drifts are to be started when the 700-foot level is reached. The White mine, on the Hasayampa, is to be equipped with a modern 20-stamp mill. The River Bend G. M. Co. has been organized in Prescott, with H. Henry president, M. Y. Henry vice-president and T. W. Baker secretary. The company owns the River Bend claims, 15 miles west of Hillsdale.

The Colonel M. Co., near Crown King, will put in a new hoist.—It is reported that work will be resumed at the Mudhole mine, near Walker.—A strike of rich ore is reported at a depth of 180 feet in the shaft of the properties of the Oro Con. Co., near Kirkland.

### CALIFORNIA.

#### Amador County.

It is reported that the Kennedy crosscut at the 2750 level has struck the main ore body. The shaft is to be sunk 200 feet deeper, making a total depth of 3000 feet.

Land along Dry creek, 2 miles northwest of Ione, is to be prospected as a possible dredging proposition. F. A. Kribs of Portland, Oregon, is interested.

#### El Dorado County.

A new shaft is to be sunk on the Rosencrans mine, near Garden Valley, which is being opened up by Geo. Nonguesser.—The Ida Mitchell mine at Placerville has been closed down.

#### Kern County.

A copy of the articles of incorporation of the Nevada & California Railway have been filed. The company is capitalized at \$15,000,000, of which amount \$457,000 has been subscribed by the five directors of the corporation as follows: W. F. Herrin, \$227,000; W. Hood, \$227,000; P. F. Dunne, \$1000; N. F. Smith, \$1000; J. L. Willcutt, \$1000. The company proposes to construct, maintain and operate a railroad, consisting of a main line 430 miles in length and a branch line of 27 miles. The main line is to commence at Hazen, on the line of the Central Pacific Railroad in Churchill county, Nev., and run thence south through the counties of Churchill, Lyon and Esmeralda in Nevada, and through the counties of Mono, Inyo and Kern, in California, to near Mojave station, on the line of the Southern Pacific. The branch lines will commence near Churchill, on the line of the Carson & Colorado Railway in Lyon county, Nev., and run west to Mound House station, Nev., on the line of the Virginia & Truckee Railroad.

#### Nevada County.

Work is being pushed on the overhead trolley electric line between the North Star mill and the Central hoist, near Grass Valley. When completed it will displace wagons hauling ore and sulphurets between the hoist, mill and cyanide plant.—N. P. Brown has organized a company to work the Austin and Wedge mines in Willow Valley, near Nevada City. H. Selson has charge of the work. A compressor, air drills and rock breaker and other machinery have been ordered and will be put in. It is intended to build a mill.—The 5-stamp mill has been started at the Kenosha mine, near Grass Valley. G. W. Root and company are working the property. Drifting is being carried on north and south, and is to be sunk to a depth of 500 feet.—In the Graniteville district, work has been commenced on the Republic mine by Wm. McLean and others, who have a bond and propose to open the property.

The old Keystone mine, near Rough and Ready, owned by J. Hackett, has been bonded to Eastern cap-

talists, who intend to develop the property, and put in a hoisting and pumping plant. It will be known hereafter as the Majestic. The shaft is down 150 feet.

#### Placer County.

A dredger has been put in at the Casb Rock mine, on the American river, near Forest Hill.—The Whiskey Diggins mine, north of Lincoln, has been sold by W. B. Hellings to San Francisco people, who intend to sink a 500-foot shaft.

#### San Bernardino County.

Rich quartz and placer gold strikes are reported from near Siding 16 of the new Salt Lake & Los Angeles Railroad near Kelso, the richest strike being 5 miles south of the railroad, near the foothills. Water and means of transportation, even burros, are lacking.

#### Shasta County.

Before the death of President P. L. Kimberley it was announced that the Balaklala Con. Copper Co. would commence work on a 1000-ton smelter at Kennett within sixty days.—R. E. Roper of San Francisco has bought in the interest of a company that he represents the Snyder and Last Chance mines, near Redding.

It is reported that the Trinity Copper Co. is to put in a large air compressor at the Shasta King mine, near Kennett.

#### Sierra County.

M. Phillips and R. B. Harper, both from San Jose, are interested in the King Consolidated quartz mine near Loganville. Arrangements are being made to build a 20-stamp mill on the property on the flat below the Marguerite mine and to be connected with the mine by an aerial tramway 1500 feet long. The South Fork will furnish the power.

#### Slaskiyo County.

A. Livingston and W. Everton, working quartz veins near Hiltz, are building a 2-stamp mill.

#### Trinity County.

The Lorenz placer mine on Dutton's creek, near Weaverville, is being worked by John, William and George Lorenz, although water is somewhat scarce. The boulders are moved by a derrick and drum worked by a waterwheel.

#### Tulare County.

The Himalaya M. Co. of New York is opening up a chrysoprase mine south of Deer Creek, near Porterville. L. Tannenbaum is the principal stockholder.

#### Tuolumne County.

(Special Correspondence).—At the Grizzly mine, 1 mile south of Carters, a new find of 10 feet of good ore has been made by running a crosscut into the footwall slates. The Grizzly was at one time a large producer.—It is intended to reopen the Dead Horse mine by extending a tunnel driven in several hundred feet on the Lady Washington, which joins the Dead Horse on the south. The water in the latter will be first tapped by means of a diamond drill. This tunnel will open the 1600 level of the Dead Horse, and will afford drainage and an inexpensive means of carrying mining to deeper levels, by using an air hoist located in the mine. It is said an arrangement will probably be made whereby any ore mined in the Dead Horse will be crushed in the Grizzly mill, a short distance from the mouth of the tunnel, but across the North Fork of Tuolumne river.—A good strike is reported in the New Albany, near Grizzly.—The Carlotta-Pennsylvania mines at Cherokee are being worked.—It is reported at Soulsbyville that Wm. Sharwood will reopen the Keltz mine, 10 miles north of Soulsbyville, near the Stanislaus river. The mine was worked in former years and was a good producer. It is the intention to continue a crosscut tunnel to the vein and drift. There are several good ore shoots known in this mine, none of which have been worked more than 50 feet below the lowest tunnel level. The new tunnel will cut several hundred feet below the old tunnel. Soulsbyville, June 6.

The cyanide plant has been started at the Arbona mine near Tuttletown.—It is reported that the Confidence mine at Confidence has been sold to L. R. Poundstone and will be worked by him.—Heavier machinery is to be put in at the Draper mine at Soulsbyville.

The 10-stamp mill on the John Royal mine is being moved to the Longfellow mine at Big Oak Flat.—L. W. Wiseman has succeeded H. L. Huston as superintendent of the Soulsby mine at Soulsbyville.—The mill at the Golden West, in the Phoenix lake district, has been started up. Wm. Floyd of Soulsbyville is in charge.

#### Yuba County.

It is reported that Mr. Spencer of San Jose will put in a hoist and start work at the Abbott mine at Rackerby.—H. C. Tate is examining the Seaboth and Davis mines at Rackerby for Eastern parties.

### COLORADO.

Judge Riner of the United States Court, in the case of the Eagle Ore Sampling Co. of Cripple Creek vs. the Telluride Reduction Co., has decided that ore shipped to a smelter or reduction plant is the property of the shipper until the consignee settles for the values obtained in the shipment. The case is, that the General Metals Co., operating at Colorado City, now in bankruptcy, succeeded to the rights of the Telluride Reduction Co. The Eagle Ore Sampling Co. had a contract for the treatment of ore. When the General Metals Co. collapsed it undertook to construe this contract as one for the sale of the ore, when, as a matter of fact, it had provided in the contract specific prices of treatment rates of from \$7 to \$12 per ton, according to the grades of the ore, the agreement providing that if the Eagle Ore Sampling Co. shipped 1000 tons more or less of low value ore, the mill could demand and collect its minimum rate of \$7 per ton. Judge Riner decided that the ore still belonged to the sampling company, taking the position that a delivery for the purpose of treatment was not a delivery of sale, and hence this ore could not be included in the assets of the General Metals Co., nor could the moneys received for the same be diverted to the creditors in common to pay their debts.

#### Chaffee County.

At the Black Hawk mine, adjoining the Mary Murphy, at St. Elmo, work is to be continued by the Mary



H. M. Co., of which T. B. Crawford is president. The ore carries good values in zinc.

At Turret men are working on the Copper King in the south drift.

A copper discovery has been made near Mears, 9 miles southeast of Salda. The Evening Star group, located two years ago by F. H. Colvin of Salda, contains an 80-foot ledge of copper ore and has been opened up by four tunnels, making in all 1500 feet of underground workings. Negotiations are being made to build a mill on Poncha creek, 800 feet from the mouth of the main tunnel.

#### Clear Creek County

A strike has been made in the Seven-Thirty workings, near Georgetown, by O. Johnson & Co., operating under lease. J. Franchini & Co., who are also leasing in the Seven-Thirty, have found the same ore body 80 feet under where Johnson & Co. are at work.—Freisel & Co. are working a lease in the Seven-Thirty, east of the old workings and west of Johnson & Co.—F. G. Watrous and W. L. Herring of Boston have purchased the Big Clave claims and a tunnel site 2 miles from Idaho Springs, up Fall river.

#### Custer County

The Invincible shaft at Rosita is being unwatered preparatory to resuming work. The shaft is down 300 feet.—It is reported that C. W. Haskell, manager of the Molrose G. M. Co. of Silver Cliff, will put in a cyanide plant to work the ore from the Hector mine.

The California claim, on the north slope of Game ridge, near Custer, is to be worked. The shaft is 200 feet deep.

#### Dolores County

The Rico-Creede M. Co. has control of the Pro Patria mines and mills at Rico and is reopening the mine. The mill will be overhauled and remodeled. C. W. Rowe is manager.—D. Swickhimer writes from Rico that he has just made an important strike in the Logan mine on C. C. hill.

#### Fremont County

The Florence oil field is south of Florence in a structural basin, covering an area of 10 to 20 square miles. Oil has been found at almost all depths from 1300 to 3100 feet. The deepest well is 3650 feet, but no oil is known to have been found below 3090 feet. The oil is found in Cretaceous beds 4450 feet thick. Gas has been found at irregular depths in beds similar to those containing oil. Gushing is unknown in this field, but when oil is struck it usually rises several hundred feet in the hole and may approach the mouth of the well. Little water is found below the level of surface water. About 500 wells have been drilled, of which 175 have been producers and sixty at present pumping. It has proved unprofitable to pump where the wells yield less than seven barrels per day. The oil is high grade, being usually refined at Florence, and the wells have long life—five years or more.

The Fountain Park M. & M. Co. has started men at work in Junkins Park, near Florence.

The Empire Oil Co. at Florence has struck oil in its third well at a depth of 2095 feet. The oil appears to be of an excellent quality, and rose to a height of 50 feet. At a depth of 1500 feet the company opened a flow of gas, which is used for drilling purposes, thereby eliminating the expense of oil.

#### Gilpin County

E. W. Williams, E. A. Whitmore, the H. Paul estate, E. W. Rogers, J. Leidinger, H. Oranhood of Denver, C. L. Harker and J. H. Kent have sold the Addude, Good Luck, Poor Luck, Bushwhacker, Formosa, Fontaine and Teegeeatch claims, all in Russell mining district, to an Eastern company, who will develop the properties.

Leahy, Barnes & Co., leasing the U. P. R. lode at Mountain City, near Central City, will put in a hoist and clean out and retimer the shaft to a depth of 200 feet. The property is owned by the Gregory Buell Co., of which R. L. Martin is manager.—It is reported that the Hubert mine, in Nevada, is to resume operations.—During an electrical storm, the shaft building of the East Notaway mine, in Lake district, near Central City, was struck by lightning, setting fire to the structure and completely destroying it. Four hundred and fifty pounds of dynamite were stored in a magazine in one end of the shaft house when the lightning struck the building. When the fire reached the powder an explosion occurred, which tore the top, building to pieces and shattered the windows in the Gulch and Pittsburg properties nearby. So strong was the explosion, drills and other miners' tools were thrown 500 feet. The detonation of the dynamite was doubtless all that saved the machinery from complete ruin. When this exploded the building was torn down, and the flames were thus prevented from reaching the engine and boiler. The East Notaway is owned by the Town Topics G. M. Co. S. A. Joseph of Denver is manager. The shaft house will be rebuilt. Hoisting will commence before the shaft house is finished.—Peters, McCoy & Co. have taken a lease and bond on a property at the head of Gambell gulch, near Perigo, owned by Cochran, Hughes & Co., and have begun operations.—The Gold Dirt mill, near Perigo, is nearly completed. Work is going on steadily in the mine, and when mill and mine are working together a large force will be employed.—The Colorado tunnel, operated by Augustus & Co., is in over 500 feet and the ore body and the value of the ore is increasing as the tunnel is extended. They are moving their mill from Lump to Gambell gulch.

On account of the heavy rainy season, the Pewabic mine at Russell Gulch has had to contend with a considerable flow of water in the 400-foot works, so that development had to be stopped. Above the 400 the output averages 400 tons daily. The company has a lease and option on the New York mill, in which it intends to treat the entire product of the mine. The iron shaft on one of the Pewabic properties is to be equipped with a shaft house and machinery.—A straight shaft is being sunk on the Happy Hollow group near Gambell gulch, being operated by the Interstate Con. M. Co.—A contract has been let for another 100 feet in the Golden Sun M. & M. company's tunnel up South Boulder creek from Central City.—It is reported that the Copper Six M. Co. will resume operations on the Sampson claims in

Leslie gulch, which are owned by Messiter, Converse & Co. of Central City and Apex.

Regarding the 10-stamp mill being put up at the Gold Dirt mine, General Hall says each stamp weighs 1300 pounds and will be rapid-drop—96 to the minute. These stamps are expected to crush fifty tons per day. The first amalgamation on plates will be followed by regrinding to 100 mesh in Huntington mills, the pulp being elevated by sand pumps to four settling cones. The sands from the bottom of the cones can be drawn off at will and spouted to either of the four revolving agitating barrels, which are 8 feet in diameter by 12 feet long, placed underneath. Cyanide solution will be pumped into the settling cones. The agitating barrels revolve in cyanide solution and the extraction is finished in six hours. These results are all based on a series of experiments conducted in a 10-ton plant last summer, the extraction being 55%. After the extraction is completed, the solution is drawn off and the pulp washed to recover what remains. The tailings are dumped into receiving bins, elevated and distributed onto dumping tables, where it is concentrated. The overflow from the settling cones is leached by percolation and compressed air agitation. This plant will be completed during June.

#### Gunnison County

The Gold Cup mine, near Tin Cup, is being operated by the East Gold Hill M. & M. Co., of which I. L. Johnson of Denver is president and general manager. The main incline is down 900 feet with a drift 300 feet north, where it cuts the vein. The company has started a 3000-foot tunnel on the opposite side of Gold hill and has it in 200 feet. This work will cut the veins 200 feet deeper than the bottom of the main incline. The incline will connect with the tunnel.

An air compressor, hoiler and electric light plant are being placed at the mouth of the Carter tunnel, on Ohio creek, near Ohio City. The tunnel is in 1400 feet, and will be driven 3000 feet to the Volunteer ground. C. Carter has charge.—The Gold Links tunnel, near Ohio City, is in 1600 feet, and has cut two good veins.—W. Scott is making preparations to develop the Williams, near Ohio City, and put in a steam hoist and other machinery.

#### Lake County

The affairs of the Sedalia mine in Evans gulch, near Leadville, have been settled and a contract has been let to sink the shaft another 100 feet, giving a depth of 1000 feet. M. McHale has the contract.

#### La Plata County

A rich strike has been made in the Bullion Mountain M. Co.'s mine in the Needle mountains, near Durango. The ore is high grade and assays run high in silver, gold and copper. The strike was made in a tunnel 800 feet from the portal, and the vein was followed 125 feet, when it widened to 30 inches. J. Bloom is superintendent and E. M. Whiton general manager.

#### Pueblo County

It is reported that molybdenum has been discovered 3 miles east of Pueblo by H. H. Bourne.

#### Saguache County

P. R. Harpel, president and manager of the Steel Canyon M. & M. Co., in which every man employed is a stockholder, has ordered a concentrating mill of 100 tons capacity. The Steel Canyon mines are in the mountains bordering the San Luis valley, near Villa Grove.

#### San Juan County

At the Waldron property, in the Mineral Point district, near the headwaters of the Animas river, above Silverton, owned by the Adelia M. Co., the shaft is down 250 feet. Manager Lowe states that they will spend \$25,000 on the property, which, it is thought, will carry the shaft to a depth of 400 feet and a drift of 500 feet. Ore is awaiting shipment to the Durango smelter.—The Old Hundred mine, northeast of Silverton, is to have a new 40-stamp mill.

It is reported that the Bullion Mountain M. & T. Co. have struck high-grade ore on Needle mountain in their 1400-foot tunnel.

The Joe Gibbons M. & M. Co., working claims above Silverton, is building a new power house, 30x35 feet, and when completed a water power plant is to be put in to operate the mine machinery. A new mill may be put in this season.

#### San Miguel County

The San Miguel Examiner reports that the Black Bear property, in Ingram basin, near Telluride, is capable of producing a steady output sufficiently large to supply a mill and that L. Kaanta, president and general manager of the Black Bear M. Co., has been securing mill sites and has an option on the Fraction placer at Pandora, where the Smuggler-Union mills are located and where the Japan-Flora M. Co. expects to construct its plant. Manager Kaanta has also an option on five acres of land at the Silverton railroad, on the Red mountain side of the range, from the Smuggler-Union M. Co. On one of these sites a mill with a capacity of 200 tons daily will be built this summer. An aerial tramway is to be built to connect the mines and mill. A new air compressor is to be put in. It is also proposed to extend the crosscut tunnel, which now stops at the vein, through the mountain to the Red mountain side of the range, a distance of 3000 feet.

It is reported that the stockholders of the Smuggler-Union M. Co. are realizing larger dividends from the operation of the Smuggler-Union mines under the leasing system than at any time since they were purchased five years ago. From 1900 until June 1, 1904, when the mines were let out in blocks to leasers, they were worked and managed by the company. In this period only one dividend of \$60,000 was paid. The big leasers, who commenced operating in the summer of last year, are paying good royalties and making money. King & Lindsey are employing 100 men and keeping 50 stamps in the Smuggler-Union mills at Pandora, 2 miles above Telluride, supplied with ore. The Telluride Leasing Co., composed of I. R. Bancroft, A. R. Townsend and A. Brodine, employs seventy-five men, and their output keeps thirty stamps in one of the mills pounding. Wagner Bros. have a long-time lease on the 76 claim, on the Smuggler-Union vein, also a lease on the old dumps of the Smuggler, Union and Sheridan mines.

#### Summit County

At the King Solomon M. & T. Co.'s mine near Frisco, Engineer Montgomery is putting in an air compressor and drills.—At Frisco, the Mary Verna Co., J. E. Parker, manager, expects to order a compressor and air drills.—The Breckenridge Bulletin reports that the Old Union M. & M. Co.'s mill is being put in shape for running under the direction of C. J. Gilbert. The jigs, tables and screens have received the necessary readjustment to suit the ore as shown by the test runs and rearrangement in the classifiers and conduits has been made. A new ore feeder is being put in to feed the ore to the rolls. The main tunnel breast is in the ledge and the tunnel is in 730 feet.

In the Upper Blue river section, at Hoosier pass, between Summit and Park counties, the Hoosier Gulch M. & M. Co. is sending in machinery for its lode works. The placers are still blocked with snow.—M. Hoskins of Leadville and D. M. Gray of Canon City are buying machinery to start work on the Sallie Barber lode, on Nigger hill, near Breckenridge.

#### Teller County

The Granite mine on Battle mountain, Cripple Creek, is producing 1000 tons a month, the values running \$40 to the ton. The company is working eighty men. Most of the ore is coming from between the 800 and 1000-foot points.—The Home Leasing & M. Co. has been incorporated by A. Jones, D. J. McNeill, M. Gardner, T. A. Tallen and J. J. Sullivan. The new company will operate ground under lease, at present working on the Home claim.—On Rosebud hill and in the draw between it and Beacon hill, Cripple Creek, sinking is in progress on the Mary Nevin, Black Jack, Grace Arthur, Texas Girl and Rocky Mountain.—The ore shoot in the Russell shaft of the Independence Con. Co. on Bull hill at a depth of 210 feet measures from 12 to 20 inches in width and through the vein runs a streak of talc in which the high-grade values are found.—On the Clara D. property, Cripple Creek, Lessee McDonald has opened up a new ore shoot. They are taking out seven to eight carloads of ore per month.—Gardner and associates, operating through the main Clara D. workings, are working on their new find, breaking a body that runs from 2 to 3 feet in width, the ore averaging \$30 a ton. Operations are confined to the surface in the East Nellie V. claim.—Lessee Ford and associates, operating a block of the Jeff Davis claim of the same company, are sending out regular shipments.—Lessee Bradner and associates, operating on the Ocean Wave, Cripple Creek, have opened up 4 feet of ore at a depth of 100 feet. A carload of screenings taken from the ore shoot gave returns of \$49.60 to the ton.—Lessees operating the Gould property, Cripple Creek, who are confiding their development work to the Ophelia tunnel, are drifting in a low-grade ore.—Lessees operating on the John A. Logan mine, owned by the Stratton Cripple Creek M. & D. Co., are taking out ore on the extension of the Gold Sovereign dyke, which was opened in the Logan territory at the 500-foot level. The Gold Sovereign dyke is expected to dip out of the Logan territory, but the operators estimate that they will get from 50 to 70 feet of the ore shoot before it leaves them.—Sinking has been resumed at the Nugget shaft of the Legal M. Co. at Cripple Creek. It is proposed to sink from the 300 to the 400-foot level and start drifts in search of a flat vein believed to cross into Nugget ground from the El Paso and the C. K. & N.—Superintendent E. Taylor expects to resume sinking in the Raaler shaft of the C. K. & N. as soon as it can be unwatered.

The production of Cripple Creek district for May was as follows:

	Tons.	Average Value.	Total Value.
Smelters.....	8,000	\$75 00	\$600,000 00
Portland.....	7,500	28 00	210,000 00
Economic.....	5,500	35 00	192,500 00
Wild Horse.....	2,000	6 00	12,000 00
Anaconda.....	2,000	5 00	10,000 00
Homestake.....	6,000	2 50	15,000 00
Santa Rita.....	465	6 00	2,790 00
Micherardo.....	450	3 50	1,575 00
U. S. R. & R.....	25,000	30 00	750,000 00
Dorcas.....	2,200	32 00	70,400 00
Totals.....	59,115		\$1,864,215 00

The Byerly cyanide mill of Gillett has added a roaster.—Selbach & Johnson, leasing on the Pride of Cripple Creek, have let a contract to sink the shaft an additional 150 feet. The shaft is down 150 feet. The Fenway M. & M. Co. has started a tunnel through this property on Straub mountain near Cripple Creek. The bore has already been driven 170 feet.

The Merger G. M. Co. is sinking the Bonnie Nell shaft on Raven Hill, Cripple Creek, to the 1000-foot level.—The Gold Nugget Leasing Co., operating the Nugget claim on Beacon hill, Cripple Creek, have let a contract for sinking a shaft to a depth of 400 feet, which, when completed, will give it a total depth of 600 feet.—A larger crusher has been put in at the King & Craig mill, on the south slope of Gold hill, near Cripple Creek.—A lease on the Louisiana lode of the Ore-Or-No-Go Co., on the southeast slope of Raven hill, Cripple Creek, has been secured by C. F. Springer of Colorado Springs.

#### IDAHO.

##### Custer County.

J. A. Czizek of Loon Creek, west of Custer, reports good progress in the construction of the new smelter, although much material on the way is delayed by the bad roads. The smelter will have a capacity of 100 tons daily. He is driving a tunnel to the Montana vein. The mine is connected by a wagon road with Custer.

##### Idaho County.

L. Phelan has discovered a rich lead on the South Fork, near the Smith ranch, near Warren.—The Monongahela Co., operating in the Thunder Mountain district, has been reorganized, being succeeded by the Braddock G. M. & M. Co., organized at Braddock, Pa., the stockholders being the same as were owners in the old corporation. W. Forsythe is president and W. A. Gardner secretary.

##### Lemhi County.

A cyanide plant is to be added to the mill of the Gold Dust mines near Leesburg.



## Nez Perces County.

W. A. Nehrhood, manager of the Hy-Bar M. Co., working a cyanide plant to extract the values from the black sands of the Snake river bars, is putting in an experimental plant 3 miles above Lewiston.

## Owyhee County.

A 350-foot raise is being made from the Addie tunnel, near Silver City, to connect with a shaft on the Calaveras claim; it is up 150 feet. A drift south from the 100-foot point of the upraise has struck good ore. Work is being pushed on the upraise so as to improve the ventilation. A. J. Orem is superintendent. He is also said to have charge of work which has been started on the Trade Dollar Extension.—R. L. Hopkins, in charge of the California mine on War Eagle mountain, near Silver City, has men running a drift north from the shaft, on the 100 level, and is in now 80 feet. The vein has widened to 14 inches.

## Shoshone County.

Injunction proceedings have been commenced at Wallace by H. S. Jones, who is seeking to restrain W. R. Swicegood from working on the Mammoth tramway and extracting or removing ore therefrom. Jones alleges that he had a lease from the Federal M. & S. Co. which entitles him to the possession of the Mammoth tramway and ore bins. The complaint recites that while Jones was in the possession of the property, May 22, Swicegood, without any right, ejected him, and has since excluded him from the ground. It is alleged that since that date Swicegood has extracted from the tramway ore valued at \$600, which he threatens to remove. The court is asked to restore the property to the plaintiff and eject the defendant.

T. Anderson of Wallace, one of the stockholders of the Rex M. Co., has a year's lease upon the property. The lease covers the Sixteen to One, the Bimetallic Fraction and Ambitious claims, and the mill, tramway, water rights and machinery. It is stipulated that the lessee work steadily and continuously with a reasonable force employed underground, and to treat the ore in the mill as it is extracted. The company will receive a royalty of 25% of the net smelter returns. Anderson agrees to sink a winze at least 100 feet lower than the present lowest tunnel level.

The Cornucopia G. M. Co. has been formed at Wallace by F. Frohling, Murray, C. W. Betts, Murray, J. P. Sheehy, Wallace, G. Steward, Wallace, and W. W. Woods, Wallace, to work the Golden Gate Fraction, Spokane, Golden Slipper and Cornucopia lodes, in Summit mining district, east of Murray.—The electric power line of the Oom Paul mine is completed, the hoist is in position and ready to begin sinking. The electric line is strung on the Federal poles from Butte to the power house, thence across the mountain to the mine. The hoisting plant is underground.—M. H. Hare represents an Eastern company proposing to dredge placer ground on Oro Fino creek, near Pierce.

## Washington County.

The Weyant M. Co. has an option on the Rock Flat M. Co.'s properties, near Meadows, and has C. H. Nazro examining them.

## KANSAS.

During May in the Kansas, Indian Territory and Oklahoma oil fields 375 wells were completed, of which 257 found oil, 50 were gasers and 68 failures. On May 31 there were 42 rigs and 235 drilling wells in the field. This field has an area of nearly 11,000 square miles and extends from Paola, in eastern Kansas, southwestward 200 miles to Muskogee, I. T., and Cleveland, Okla. Most of the wells are operated by companies which lease the land on royalty. A number of independent refineries are being built in Kansas. Since 1896 operations in the Kansas field have been largely in the hands of the Prairie Oil & Gas Co., the Kansas branch of the Standard Oil Co. The oil has an asphaltum base and is dark brown or black in color, and varies greatly in specific gravity in different localities.

## MONTANA.

## Jefferson County.

The Basin Reduction Co., operating the concentrator in Basin, intend enlarging the mill this summer. The series of Callow settling tanks put in last year have proven a success, and the company has purchased thirty more, which will be put in together with fifteen tables to take care of the product from the extra tanks. The tail race has been extended and the water is run into cars, allowing the tailings to settle in the cars, the Great Northern railway using the tailings to fill in the bridges and trestles along their line. This system is temporary, and as it has not proved a success they plan to build a tail race to run over a series of settling tanks, and when these are filled the contents can be dumped directly into cars, the whole to be enclosed in a building that will be so arranged that it can be heated by steam during cold weather, allowing the work to go on at all times.—The Morning Star mine,  $\frac{3}{4}$  mile from Amazon station, near Boulder, owned by S. Myhre, has been leased and bonded by the Amazon-Butte M. Co. A 35 H. P. boiler has been put in and a hoist capable of sinking 300 feet. The shaft is being cleaned out to the 125-foot level when they will crosscut to get the lead. W. R. Evans of Butte is president.—Hart & Stephens of Butte have taken a lease and bond on the Dewey, 1 mile from the Morning Star, and are crosscutting the tunnel for the lead.

## Missoula County.

J. A. Scott, president of the Kennedy Creek G. M. Co., reports that his company is building a ditch from Butler creek to carry more water to their place, 32 miles from Missoula.—A. L. Thurston has bonded the interest of his partner, G. Cox, in the Rough Rider claims, 6 miles from De Borgia.

## Silver Bow County.

(Special Correspondence).—The copper production of the Butte district for May was 23,220,000 pounds, the various companies contributing as follows: Boston & Montana (Amalgamated), 6,076,000 pounds; Anaconda, Washoe, Parrot, Trenton and Butte & Boston (Amalgamated), 13,702,000 pounds; United Copper, 3,730,000

pounds; Clark mines, 3,627,000 pounds; North Butte (Speculator), 1,085,000 pounds. The Parrot, one of the Amalgamated mines, was closed by injunction during nearly all of May and its production of about 35,000 pounds a day cut off, but the shortage was made up from other Amalgamated mines, the output from which was temporarily increased. The average value of the ore shipped from some of the Amalgamated mines was also higher than April. The Rarus mine of the United Copper was also shut down for a while.

The daily yield of ore and pounds of copper for May was:

	Tons of Ore.	Pounds of Copper.
Boston & Montana.....	2,800	196,000
Anaconda, etc.....	6,800	422,000
United Copper.....	2,000	130,000
Clark Mines.....	1,800	117,000
North Butte.....	500	35,000

Butte, June 5.

## NEVADA.

## Lincoln County.

G. Freeborn is working properties on Pinto mountain, 3 miles north of Searchlight.—The shaft of the Searchlight M. & M. Co. at Searchlight has been straightened under the direction of Superintendent H. E. Carter and the hoist is being placed. A 30-ton roller mill is to be put in.—The Bamherger-De Lamar mine at De Lamar is opened by levels to a depth of 1000 feet. The main working tunnel is in 3700 feet. Water is pumped 14 miles from Meadow Valley where the electric power plant is also located. According to the Searchlight, the mill treats 11,500 tons monthly, being hauled from the mine by an electric locomotive. After preliminary crushing the ore is crushed in Chilean mills in cyanide solution and then conveyed to settling tanks, separating sands and slimes which are subsequently treated separately. The sands remain in the tanks for treatment by .3% cyanide solution and the overflowing slimes are treated by decantation and agitation. The water consumption is 118 gallons per ton of ore crushed. A new 600-ton mill is being built to treat the old tailings dump.

The California-Utah G. M. & M. Co. is working the Amethyst-Wild Irish mine, at Pikes Diggings, near Fay. The Amethyst shaft is to be sunk from the 130 to the 200-foot level and a double-compartment shaft will be sunk on the Wild Irish and connection made with the Amethyst shaft. D. K. Kilbourne of Los Angeles is interested in the company.

E. H. Hackett, superintendent of the Newport & Nevada at Deer Lodge, 24 miles from Uvada, Utah, is adding cyanide vats to the company's mills to treat the tailings. As soon as this is done the mill will start up.

## Lyon County.

The Goldfield Exploration Co., of Salt Lake, through O. A. Tibbetts and F. A. Flindt, have taken a bond on the Dyer copper claims, south of Yerington, and will develop them.

## NEW MEXICO.

## Grant County.

The Detroit-New Mexico M. & D. Co. is working placer ground on Whitewater creek, 3 miles from Central, using hydraulic giants and centrifugal pump.

## Luna County.

The smelter at Deming is to be blown in this month.

## Rio Arriba County.

M. J. P. Gill has resumed operations on placers at Hopewell after fighting water.—Superintendent Robinson has commenced unwatering the shaft of the Red Jacket, in Bromide district, preparatory to resuming work. The machinery for the mill is being hauled from Tres Piedras and is apt to be at work some time this month.

## Santa Fe County.

A pneumatic concentrator has been constructed in Tuerto canyon, near Golden, by the Pneumatic Concentrator Co., in which P. Kleck of New York is interested. Operations in the mill are to begin on June 15. The mill has 200 tons capacity and the cement tested carried from \$3.50 to \$5 free-milling gold per cubic yard. Previous attempts to extract these values have been unsuccessful.

## Socorro County.

E. Craig, manager of the Ernestine M. Co., says that the 500-ton concentrator and cyanide mill at Cooney is shipping \$30,000 worth of concentrates to the El Paso smelter every month. Three air drills have been operated in the main shaft, which is down 1100 feet.

## OREGON.

## Baker County.

A. Geiser, who is operating the Bonanza mine near Sumpter under lease, says that work is progressing on the 200-foot level and that the ore body recently exposed is proving rich. The mill has been started.—More men have been put to work at the Standard mine in the Quartzburg district. A sawmill is to be built and many other improvements made.—The E. & E. mine at Bourne is cutting a station below the 200-foot level to establish pumps and other equipments preparatory to sinking the main shaft.—The Connor Creek mine, bonded by P. Basche of Baker City, is to have a new 10-stamp mill.

J. A. Wilson, superintendent of the Mayflower mine, in Cornucopia district, states that work in the long crosscut to tap the main Mayflower and four other parallel veins is in progress and work is also being done in level 2 blocking out ore for the mill soon to be put in.—Work has been resumed at the Golden Chariot mine, near Sumpter. As soon as the hoist is ready, it is the intention to unwater the shaft and finish crosscutting to the vein on the 100 level, after which it will be extended an additional 200 feet.

The Indiana mine, 23 miles east of Baker City, is being developed under the management of J. W. Messner.—T. H. White, T. W. Ayers and H. J. Stillman of Pendleton have formed the Gold Coin M. Co. to work claims near Durkee.—The Queen of the West Mines Co., whose property adjoins the Cornucopia mine, has purchased a 10-stamp mill to be put up this summer. C. F. Soderling, president and manager of the company,

states that they are building an aerial tramway 3100 feet in length from the tunnel to the prospective millsite, and are also building 2 miles of roadway from Cornucopia to the mine.

## Jackson County.

The Lucky Bart mill, on Sardine creek, started its stamps on ore taken from the Corporal G mine. This property is owned and being developed by J. R. McKay of Gold Hill.

L. B. Chase and S. M. Rhodes of Ashland, developing a vein on Cantrall gulch, 2 miles west of Jacksonville, have made a shipment of smelting ore.

## Josephine County.

The Rogue River M., S. & P. Co. has been formed with D. C. Westlake of Grants Pass as president and W. E. Williams of Wilmington, Ohio, as secretary. C. N. Jones of Portland will have charge of the building of the proposed smelter near Grants Pass, and W. I. Fleck of Grants Pass will be consulting engineer. A Corliss will be superintendent and will have charge of the work on the smelter building and the dam. C. L. Proehstel will be assayer and chemist for the smelter. The site for the smelter has been selected at Savage Rapids, on Rogue river, 5 miles east of Grants Pass. The company proposes to put in a dam in Rogue river and supply water and power for irrigation purposes. The dam is being built with the slag from the smelter.—The Rogue River M. & L. Co., under the management of L. W. Smith, are prospecting their gravel deposits on the left fork of Fooths creek, near Grants Pass, by drifts being driven through the channel showing a deposit to have a depth of not less than 30 feet.—While waiting for their electric machinery the Champlin Dredging Co. on Fooths creek are prospecting their ground on the right fork of the stream and halting the ground ahead of where work is to be resumed. Holes are drilled to the bedrock at 50 feet apart and charged with 100 pounds of dynamite. It is estimated that each shot will loosen 3000 yards of gravel at the cost of 1½ cent per yard, and will facilitate digging when work is resumed.

## SOUTH DAKOTA.

## Lawrence County.

(Special Correspondence).—The Tinton Co. has engaged F. R. Carpenter as general manager of its gold and tin mines in the Bear Gulch and Nigger Hill region. Dr. Carpenter was the first engineer to make a careful examination into the character of the tin-bearing deposits of the Black Hills, while dean of the School of Mines at Rapid City. Later he built and operated the Deadwood & Delaware pyritic smelter at Deadwood. The tin veins of western Lawrence county are dikes of pegmatite granite. These dikes are of very coarse crystallization, containing white and rose-colored quartz, mica, and various feldspars, abundant tourmaline, apatite, and the more rare iron ores, such as wolframite and columbite, with cassiterite. In many respects the tin ores of the district resemble those of the Harney Peak region in the southern Black Hills. A testing mill has been built at the mines at Tinton and a large tonnage of ore treated by concentration.

Spearfish, June 3.

(Special Correspondence).—At the Wasp No. 2 on Yellow creek, 2 miles from Lead, another of the great blasts for which this mine has become famous is in preparation. The ore lies in a nearly horizontal bed. A series of deep holes is drilled and these are sprung repeatedly with nitro powder, and the final blast is prepared by mixing black and nitro powder. A few months ago a blast of this kind was reported to have dislodged 6000 tons of ore, mention of which was made in these columns at the time. The ore is low grade—\$5 per ton—but it is successfully treated by the cyanide process at a profit. Wolframite has been profitably mined at this mine. This ore also contains gold.

Lead, June 2.

The Horseshoe mill is to be rebuilt either at the old millsite at Terry or at Pluma. The company is working the Ben Hur and McDonnell regularly, and is shipping ore to the smelters. R. N. Ogden of Deadwood has been appointed receiver of the affairs of the Horseshoe M. Co. upon application by the Hearst Mercantile Co. The appointment was asked for merely as a measure of safety and to save cost to the company. There are a number of liens, amounting to \$30,000 and over, unpaid, and other claims against the company that may become liens. These would result in numerous lawsuits unless some proceeding like the present was taken. Production from the mines will continue, ore shipments going to Omaha smelters, the Lundberg, Dorr & Wilson cyanide and a small amount to the Imperial mill.—F. E. Little of Minneapolis, president of the Minnesota M. Co., working near Maitland, intends to put in a 200-ton mill.—The Gladiator Co. has men drifting on the Red Cloud group, near upper Deadwood gulch.—The Deer Lick Co., operating on Deer creek, west of Spearfish, has placed orders for a hoist, boilers, air compressor, drills, pumps, etc., and expects to put them in and begin active development. Figures on a 100 ton cyanide plant are being secured.

## Pennington County.

The Canton Co., of Hill City, is preparing to put in a mill.—Manager E. J. Kennedy of the Golden West Co. reports a successful run at the company's new mill on Castle Creek near Rochford. The mill operates by water power; a bucket tram transports ore from the mine bins to the mill; in the big quarry or open cut a belt conveyor is used to transfer ore to the bins. It is possible that a cyanide annex may be added to the present amalgamation mill.—Hydraulic mining at Placer-ville, on Rapid creek near Pactola, is being carried on with four nozzles at work on the bar, handling 2600 yards of gravel daily. This ditch is 4 miles in length, 8 feet wide and over 4 feet deep, and runs from Pactola to Placer-ville. At present the operations consume 2760 miner's inches of water, but with the addition of more nozzles all the water in Rapid creek will be used, over 4000 miner's inches. L. A. Richards is manager.—E. C. Johnson is unwatering the Gertie mine,  $\frac{1}{2}$  mile south of Hill City. A mill is being put up to treat the ore, which carries values in tin and gold.



## UTAH.

## Salt Lake County.

The Boston Con. Company at Bingham will drain the Copper Central tunnel and crosscut from it to open up the new strike being developed from the Peabody tunnel. The Copper Central tunnel is in 3500 feet on the south side of the property. The Highland Boy storehouse at Bingham has been doubled in size. The Red Wing air compressor and drills in Bingham canyon have been started up.

It is reported that a shaft is to be sunk upon the Maxwell group, at Bingham. New machine drills are to be put in at the Fortuna mine at Bingham, the air to be secured from the Dalton and Lark.

## Summit County.

At the Comstock mine at Park City two pumps are handling the water. Superintendent Jas. Hickey expects to strike the ore body soon. Work has been commenced at the Columbus mine, near Park City, under the direction of F. A. Bird.

## Utah County.

The Buckley mine in Rock canyon, east of Provo, is under the management of the Woodward Bros., who are working two shifts to finish the shaft, which will connect the upper workings with the lower tunnel, from which they are now taking ore.

## WASHINGTON.

## Ferry County.

Work has been started by the Keller & Indiana Consolidated Smelting Co. on a 150-ton smelter at Keller. A 50-ton sampling plant is to be put in. Electricity generated by water power on the San Poil river is to be used as power.

## WYOMING.

## Carbon County.

The alterations to the concentrator of the Penn-Wyoming Co., at Encampment, have been completed and the mill started. The tramway is bringing down ore from the mine and the smelter should soon be in operation. It is stated that work is to be resumed on the Continental C. M. Co.'s property in the Cow Creek district, near Battle. The Gertrude Co., at Battle, will commence sinking as soon as heavier machinery can be put in.

## Fremont County.

The South Pass gold mining district, 40 miles south of Lander, consists of a belt of metamorphic schist 20 miles long and 15 miles wide, cut by dikes of diorite, and auriferous quartz veins. It lies at the foot of the Wind River mountains, and is drained by the Sweetwater river and its tributaries, Gold, Pine, Willow, Rock and Strawberry creeks, all of which have produced placer gold.

## FOREIGN.

## AFRICA.

Barretts-Berlyn is said to be one of the cheapest-worked gold mines in the world. At the Pilgrim's Rest venture during the year ending February, 1905, 9s. 1d. per ton covered all expenses. The ore treated is a brown tuffaceous earth averaging in value about 4 dwt. per ton. During the year the deposits worked yielded good supplies of low-grade ore, the following tonnages being dealt with, namely: Ore mined and sent from Bannister's Reef, 9490 tons; slimes from reserve, 2145 tons; total, 30,374 tons, the whole of which was treated by direct cyanidation and produced 5718 ounces of gold, realizing £18,977, and gave an average extraction of 3 dwt. 18 gr. per ton. The cost of production was further reduced during the past year to 9s. 1d. per ton, the lowest figure ever reached by this company. After charging all items of expenditure, both in London and South Africa, writing off large amounts of repairs, loss of livestock, depreciation in the market value of investments, prospecting work, etc., the financial position has improved to an extent of £5403, which amount has been applied to the reduction of last year's deficit of £15,560, bringing the debit balance down to £10,157.

## AUSTRALIA.

## New South Wales.

The total value of the mineral output of New South Wales in 1904 was \$32,012,790, an increase of \$1,431,520 on that of 1903. The total number of persons employed is estimated at 37,837. The value of the plants in operation in metalliferous mines, including the dredging plants, is \$10,157,180. The gold yield for 1904 was 269,778 ounces fine, valued at \$5,730,545, showing an increase of 15,557 ounces and \$330,400 in value, as compared with 1903. Cobar is the principal gold field of the State, with an output of 61,734 ounces fine, valued at \$1,311,065. The Mount Boppy gold mine is the largest of the State. The value of the yield obtained by the dredgers was \$1,249,180. The Araluen division is the principal center of gold dredging operations, with fourteen plants at work during 1904. The dredging for tin is now a firmly established industry, and the quantity of tin ore saved by these plants during the year amounted to 319 tons, valued at \$130,900. The number of dredging plants in commission at the end of 1904 was forty-two, valued at \$1,177,880.

## CANADA.

## BRITISH COLUMBIA.

## Boundary District.

Work has been resumed on the Don Pedro in the Lake group in Skylark camp, owned by the Chicago-B. C. M. Co. It is expected that the long tunnel on the Betts and Hesperus group, Hardy mountain, 4 miles from Grand Forks, will soon tap the main ore body at a depth of 225 feet. A. D. McPhee, superintendent of the McKinley mine, north Fork of Kettle river, near Franklin, reports that the tunnel has tapped the ore vein after driving 94 feet.

The Great Northern has had a number of ore cars built that will hold 50 tons each of Boundary ore. They

were constructed specially for use on the run between the Granby mines and smelter. They will arrive in time to be used when the daily tonnage is increased by 700 or 800 tons, which will be when the new furnaces, now being installed at the smelter, are in operation—some time in July. Three groups of mines in the Boundary are now being exploited with the diamond drill. For eight or ten months the Granby Co. has had Boyles Bros. of Spokane, Wash., doing this work on the Monarch and adjoining claims, and it still continues. The British Columbia Copper Co. is operating its own diamond drill at its Mother Lode mine in Doodwood camp, and L. D. Wolfard, president of the Wellington Co., has Knight & Stone of Spokane at work on the Wolfard group, where a contract has been made for a starter of a thousand feet of holes. F. M. Elkins of Greenwood and W. E. Hodges of Vancouver have given a bond of \$125,000 on the Fairy Queen claims, near the Kingston group in Hedley camp. W. E. Collis and associates of Victoria have taken the bond and are expected to start development work shortly.

## East Kootenay District.

The two additions to the St. Eugene boiler and compressor building at Moyie are finished and ready for the new 20-drill compressors and boilers. The St. Eugene mines are owned by the St. Eugene Con. M. Co., James Cronin, manager, at Moyie. The workings extend along the St. Eugene outcrop for 4300 feet, the upper workings being 1800 feet higher than the lower ones on the shore of Moyie lake. Until recently mining has been entirely by adit tunnels on the vein, with stopes therefrom. On the highest workings of the St. Eugene there are five tunnels about 100 feet apart vertically; the intermediate workings have four tunnels and the lake shore four tunnels, No. 1, 100 feet above the lake, being in 1700 feet. Near the mouth of this tunnel a shaft has been sunk 125 feet and levels run in both directions. The ore from the upper workings is carried to the mill by an aerial tramway, that from the lower workings and shaft 1/4 mile on a surface tramway. The ore is galena in a quartz matrix, and as mined, carries from six to eight ounces silver and 13% to 14% lead, which is concentrated in the mill to thirty-three ounces silver and 66% lead. The daily output is 400 to 500 tons. The work of putting in the foundation piers for the steel tippie at Coal creek, 5 miles from Fernie, is proceeding rapidly; twenty-five are completed and twenty-five more are under way. There are 135 piers altogether. Speaking of the contract between the C. N. P. Coal Co. and the miners, President Sherman of the union stated that the wage schedule for the past two years had been improved in some cases. Fire bosses received a raise of 35 cents per shift and blacksmiths got a slight increase. The equal distribution of cars was one of the several working conditions which were improved.

## West Kootenay District.

The 10-drill compressor for the Silver Dollar mine, on Mohawk creek, in the Lardeau, is being packed in over the trail in small sections. The Silver Cup mine, near Five Mile, in the Trout Lake division, is working a full crew under the direction of T. Baribeau. The ore is treated in the combination concentrating, chloridizing and amalgamating plant operated by Ferguson Mines, Ltd. Acting Manager E. G. Hadrow describes the process as follows: The fine ore passes through grizzlies and the coarse through two Blake crushers into storage bins below. The twenty 1000-pound stamps each crush four tons per day through a 16-mesh screen. The pulp is classified into coarse and slimes. The coarse is passed into biddles, where most of the barren sand is removed and the galena separated from the remaining sulphurets, this product from the biddles being shipped as concentrates to the Trail smelter. The remainder, consisting mostly of zinc blende, tetrahedrite, iron pyrites and some sand, is thrown on to a storage floor and left to drain. The slimes are passed into spitzkasten and the surplus water removed. From there they are passed on to two Frue vanners, the headings from which pass to the storage floor below and are mixed with the tailings from the biddles. After draining, the product is dried in a revolving drier and heated with the waste gas from the roasters. There are two White-Howell roasters, into which the ore is charged with the requisite amount of salt and chloridized. It is then charged into amalgamating pans and the gold and silver amalgamated. The mill is operated by water power.

## Nelson District.

The Board of Trade of Nelson has passed a resolution that it is their wish that the payment on the bounty of lead ore be not extended after June 30. The opinion is that the bounty law is not a success.

## JAPAN.

The new mining law of Japan is now in effect. Its principal provision from the foreigner's view is that it debars any foreigner from owning or working mines in Japan.

## MEXICO.

## Chihuahua.

G. G. Gillette of Parral sold the Quebradillas mine of the Quebradillas M. Co. to M. J. Condon, J. W. Connor and C. F. Hunt of New York. J. W. Connor will be manager of the new company to be called the Veta Colorado M. & S. Co.—G. G. Gillette and associates have bought the Iguala mine near Parral and will put in a hoisting and pumping plant.

D. M. Evans of Parral has a concession to build a smelter of 250 tons capacity, combined copper and lead, says the Chihuahua Enterprise. The concession was granted to D. M. Evans, S. Garrison, W. J. McMarlin and S. F. Lathrop, the last four being of Pittsburg, Pa. The location is 4 miles below Parral on the Mexican Central Railroad, convenient to the copper and lead mines owned by companies of which Mr. Evans is general manager. The Guadalupe mine is copper and the Providencia and Big Four group are lead. It is proposed to build a wire tramway from the Guadalupe mine to the smelter, which will be 1 1/2 mile long. The concession is for fifteen years, with the usual exemptions from State and municipal taxes. The minimum capacity to be allowed is 80 tons daily, but the plan is to build at once

a 250-ton plant. This corporation will be controlled by the Guadalupe M. Co., the Big Four M. Co. and the Providencia M. Co.

The American S. & R. Co. has commenced a three-compartment shaft on the Velardena mine at Santa Eulalia. On the Nueva Chihuahua at Santa Eulalia J. Mitchell will sink a shaft. Escobar & Ross are drilling a well near the Dolores mine. If water is struck they propose pumping the water to their jig concentrating plant, which is said to have treated the Dolores ore very successfully. It is reported that L. Ruth and C. Smythe are preparing to put in a smelter near Arechuyvo. Ruth & Smythe represent J. E. Carnahan, a steel manufacturer of Canton, Ohio. They have copper properties in that district which they have been working for two years.

## Oaxaca.

The Mexico Gold & Silver M. Co. will build a 10-stamp mill at Santiago Minas, Oaxaca, where it is operating four properties—the Noche Buena, Providencia, Santa Rosa and El Sol. Ore running over 400 ounces silver per ton is reported in the Noche Buena. The general offices of the company are in St. Louis. E. C. Rendell is president, E. J. Krauss, vice-president, and C. F. Hoanel, secretary.

## Commercial Paragraphs.

E. M. HERR has been elected first vice-president Westinghouse Electric & Manufacturing Co., Pittsburg, Pa.

J. K. FIRTH, JR., is assistant district manager Wagner Electric Manufacturing Co., 417 Rialto Building, San Francisco, Cal.

THE Jeanesville Iron Works, Hazleton, Pa., has established a New York City office at 1 Broadway, with H. W. Weyhenmeyer in charge.

"ADVERTISING FOR PROFIT," 5th edition, from the Manufacturers' Advertising Bureau, 126 Liberty St., New York City, gives several capital pointers to the modern trade journal advertiser.

KNUT POSSE, M. E., for the past twelve years with Fraser & Chalmers, and their successors, Allis-Chalmers Co. of Chicago, has resigned his position to assume charge of the mining department of Chalmers & Williams, who have established their works at Chicago Heights, a suburb of Chicago, with main sales office at room 1553, Railway Exchange, Chicago.

THE Utah Mining Machinery and Supply Co., Salt Lake City, Utah, are installing twenty more Callow tanks in the Callow slime plant at the Heinz concentrator, Basin, Mont. They also have orders from the Boston & Montana Co., Great Falls, Mont., for the first unit of Callow tanks in the 3000-ton concentrator of the B. & M. They are making shipments of these tanks into Arizona, Mexico and Canada.

THE Homestake M. Co. has adopted pneumatic haulage for its gold mines at Lead, S. D., and has placed an order with the Ingersoll-Sergeant Drill Co. for a duplex four-stage Corliss air compressor to supply the power. Fourteen pneumatic locomotives will supersede the present mule service. The compressor to supply air at 1000 pounds pressure for this service is stated to be the largest high pressure compressor in the world.

THE Compressed Air Machinery Co., 24-26 First street, San Francisco, Cal., have leased the spacious premises 25, 27 and 29 Stevenson street, giving them an additional 76x100 feet which they will use as a machine shop on the ground floor for the manufacture of their air compressors, drills, drill making and sharpening machines and mine hoists. This adjacent property will afford room for needed enlargement. The office and salesroom will be retained, corner First and Stevenson streets.

THE Prinz & Rau Mfg. Co., Milwaukee, Wis., have just received through their representative, J. P. Sterling, Kansas City, Mo., an order for two large Perfection dust collectors, with steel drums, from the Dorcas Mill, Mining & Development Co. of Florence, Colo. This order is in addition to a number of machines they are now using. The Prinz & Rau Mfg. Co. are receiving quite a number of inquiries for their machines from all over the mining districts. These machines have been proven a success in saving dust and fumes which contain large values.

A. P. HEAD, London representative Wellman-Seaver-Morgan Co., Cleveland, Ohio, has completed a tour around the world, during which he established the following sub-agencies for the company: Melbourne—Australian Metal Co. as Australasian agents. The branches of this concern are as follows: New Zealand—The Gilbert Machinery Co., Wellington; Queensland—J. Stothert, Brisbane; N. Queensland—J. Croker, Mackay; New South Wales—W. R. Laidley, Sydney; South Australia—J. C. Fraser, Adelaide; West Australia—A. E. Thomas, Coolgardie; Tasmania—L. Tullock, Launceston. In India the following agencies, representing the presidencies of Bombay, Bengal and Madras, were appointed: J. Harper, Calcutta; F. Harrison, Bombay; W. H. Oakes, Madras.

CARY & FIELDING, 1711 Tremont St., Denver, Colo., have an order from the Old Hundred mine, near Silverton, Colo., for a complete concentrating mill. The mill, when completed, will have a capacity of 400 tons per day and consists of twenty-eight Card tables, forty 1300-pound Boss stamps; crushers, boilers, Cameron pumps; seven alternating current generators; shafting, pulleys and belting. The building is to be of steel and a portion of the walls to be of cement and floors of cement. The mill will cost approximately \$150,000. They also report the sale of Rand compressors as follows: One to Pride of West mine, Silverton, Colo., one large Imperial type to the Vidler tunnel, Georgetown, Colo.; one to Delta, Colo.; one to Colorado Springs, Colo.; two to South Dakota; one to Central America; one to Wallace, Idaho; one to Georgetown, Colo.; also, seven Cameron pumps for different sections.



## Books Received.

"Contributions to Economic Geology, 1904," S. F. Emmons and C. H. Hayes, geologists in charge, Bulletin 260 of the United States Geological Survey. This is the third bulletin of a series prepared to give prompt publication of the results of economic geological investigations. They are condensed to meet the wants of the busy man, much of the material to appear later in more elaborate form. The papers are grouped according to the subjects treated and at the end of each section is given a list of previous Survey publications on that subject. The volume is a valuable one and should be in the library of every mining man. It is sent free upon application to the Director of the United States Geological Survey at Washington, D. C. Under the head of gold and silver, W. Lindgren writes on the production in the United States in 1904, and other writers describe special districts in California, Colorado, Maryland, Nevada, Utah and Washington. Tin, molybdenum, uranium, vanadium, copper, lead and zinc, iron and manganese, coal, petroleum, natural gas and asphalt, building stone, cements, clays, salt, gypsum, sulphur, phosphate, mica, graphite, abrasive materials and hot springs are each discussed from an economic standpoint.

"Terminal Harbors of the Panama Canal," by L. W. Bates, is a monograph stating conditions at the Panama and Atlantic termini of the Panama canal and suggesting the formation of artificial lakes and locks as an aid to the project. It is an elaboration of parts of the author's previous monograph on "A Project for the Panama Canal." It includes maps of Panama and Limon bays and relief views of the isthmus.

## Trade Treatises.

The Replodge Governor Works, Akron, O., send a standard catalogue descriptive of their new mechanical relay governors.

Catalogue "A" from the Denver Balance Co., 3000-3006 Larimer street, Denver, Colo., illustrates and describes their pulp, assay, and analytical balances.

## Obituary.

E. J. PITHEY, cashier of the Utah Con. mine, died at Salt Lake, Utah, June 3, aged thirty-five years.

A. J. C. FAYE, New York manager Joseph Dixon Crucible Co., died in New York, May 26, aged 72.

W. S. DYER, a pioneer miner of Siskiyou county, Cal., was found dead in the tunnel of his mine, near Gazelle, Cal., June 1.

J. S. HAMMOND, superintendent Rawhide mine in Tuolumne county, Cal., died in San Francisco recently after having been crushed by a cave in the mine.

P. L. KIMBERLEY, president Balaklala Con. Co., died in Chicago, June 4, of apoplexy, aged fifty-nine years. He had been in many mining enterprises throughout the West and was a pioneer in copper mining in the Lake Superior regions.

W. C. JUTTE of Pittsburg, Pa., died May 24 at Atlantic City, N. J., aged 44 years. He was interested in the Monongahela & Western Dredging Co., the Jutte & Foley Contracting Co. and the Pittsburg Gravel & Dredging Co.

E. J. BONSTELL died of yellow fever at Panama on May 22, being on his way to take a position with the Darien G. M. Co. Mr. Bonstell had made his home in California for several years past at Sutter Creek, coming from the Tintic district of Utah. He was an expert miner, an assayer and a successful cyanide and chlorination man.

## Dividends.

Bunker Hill & Sullivan M. & C. Co., dividend No. 93 of \$1,500,000, June 5th; total paid since January 1st, 1905, \$2,175,000; total to date \$4,446,000.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING MAY 30 1905.

791,327.—PIPE ELBOWS.—D. F. Asbury, Seattle, Wash.  
791,000.—CHEESE SCREEN.—W. H. Bartels, Fruitvale, Cal.  
791,244.—SHAFT BEARING.—Carpenter & Baker, Los Angeles, Cal.  
791,411.—FIREARM.—C. Freeman, San Diego, Cal.  
791,024.—PAPER FILE.—T. P. Gower, S. F.  
791,190.—GATE.—L. Hanson, Cottonwood, Idaho.  
791,419.—BRAKE SHOE.—F. A. Hawk, Central Point, Or.  
791,150.—RAIL CLEANER.—G. Huff, Tropic, Cal.  
791,207.—BRISTLE DEVICE.—P. H. Rogers, San Bernardino, Cal.  
791,037.—LUBRICATOR.—P. Le Sueur, Calabasas, Cal.  
791,187.—STONE SAW.—A. H. MacNutt, S. F.  
790,909.—FRUIT WASHER.—L. McCann, Ontario, Cal.  
791,044.—METER DIALS.—J. M. McPheters, Everett, Wash.  
791,158.—UMBRELLA RACK.—A. Mikulich, Sacramento, Cal.  
791,302.—THE PLATE.—A. A. Mott, Summit, Cal.  
791,300.—OILING DEVICE.—R. Nelson, Los Angeles, Cal.  
790,974.—CAR BRAKE.—J. C. O'Neill, S. F.  
791,106.—RAILWAY TIE.—J. E. Owens, Porter, Wash.  
791,305.—OIL BURNER.—P. J. Owens, S. F.  
791,309.—INDEX.—E. Peycke, Los Angeles, Cal.  
791,210.—MOTOR VEHICLE.—R. M. G. Phillips, Los Angeles, Cal.  
791,356.—WAVE MOTOR.—T. Rapp, Los Angeles, Cal.  
791,292.—VEHICLE WHEEL.—J. C. Rencherford, Paradise, Ariz.  
791,318.—SAWHORSE.—W. S. Schuyler, Oceanside, Cal.  
791,219.—HOG TRAP.—W. S. Schwartz, Perrydale, Or.  
791,372.—HORSE BLANKET.—R. A. Seaders, S. F.  
791,290.—JOINTS.—H. E. Smith, Roslyn, Wash.  
791,051.—NUT LOCK.—A. P. Steel, Stockton, Cal.  
791,060.—PICTURE HANGER.—B. G. Wallace, Portland, Or.

## Latest Market Reports.

SAN FRANCISCO, June 9, 1905.

### METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, bar silver, 58½c, refined (1000 fine); San Francisco, 58½c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, \$15.50; Lake, 1 to 3 casks, \$15.50@15.50; Electrolytic, 1 to 3 casks, \$15.50; Casting, 1 to 3 casks, \$14.75@14.75. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £65 11s 3d spot per ton.

Within the week copper had shown an advance of ½ cent per pound, to 15.5c. There is no indication of further immediate advance, but there is no evidence nor any apparent reason for a lower price than that to-day quoted.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £12 18s 8d long ton.

SPELTER.—New York, \$5.30; St. Louis, \$5.70; London, £23 12s 6d per ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$29.87½; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 35@37½c. London, £136 7s 6d.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$38.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

ZINC.—Metallic, chemically pure, 3½c; dust, 3½c, 10c; sulphate, 3½c, 10c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c. ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.35; gray forge, \$16.00; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@23.00; open hearth billets, \$23.00@23.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 3c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 3c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per bbl. CEMENT.—Imported, \$2.15@2.65 per bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LUMBER.—(Retail.) Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00@shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb., 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2\*, 35%, carload lots, 9½c; less than one ton, 11c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 11½c@7c; caustic potash, 10c in 40-lb. tins; rolf sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c per lb.; copper sulphate, 5½@5½c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1½@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, boiled, bbl., 62c; cs., 67c; raw, bbl., 60c; cs., 65c; Lucol oil, boiled, bbl., 54c; cs., 59c; raw, bbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 18c; As; tral, 18c; Star, 18c; Extra Star, 21c; Eocene, 20c, Elaine, 26c; Water White, in bulk, 11½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera;

Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 15½c, do., cs., 22c; 86° Gasoline, bulk, 25c; do., cs., 31c; 83° Naptha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 53@68c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, per lb., 80c.

URANIUM.—Oxide, per lb., \$3.50.

MERCURY.—Bichloride, per lb., 77c.

TUNGSTEN.—Best, per lb., \$1.25.

PHOSPHORUS.—American, per lb., 70c.

SODIUM.—Metal, per lb., 50c.

BISMUTH.—Subnitrate, per lb., \$2.10.

SILVER.—Chloride, per oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, per lb., 7c; less than 500 lbs., 7½c.

MANGANESE.—Black oxide, per lb., 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads per 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, per ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

PROCESS OF REFINING SUGAR.—No. 790,036. May 16, 1905. Felix Deusy, San Francisco, Cal. This invention relates to improvements in treating sugar molasses, and pertains especially to the refining of the sugar and the recovery of the salts of potassium in the molasses as nitrate of potash. The object of the invention is to provide a method of treating the molasses and the exosmose water so that not only a very much larger percentage of sugar may be recovered than by ordinary methods, but there shall be saved all the values in the form of salts of potash. It consists in the process of treating molasses and as a part thereof, the osmose of the initial molasses, the mixing of the osmose molasses with a sugar-syrup solution, boiling this mixture in grain, centrifuging the boiled mixture, dissolving the sugar so separated and refining this solution.

SUBMARINE CAISSON AND TUNNEL CONSTRUCTION.—No. 790,046. May 16, 1905. Peter J. Gildea, San Francisco, Cal. The object of this invention is to provide a means by which large spaces of ground covered with water may be laid bare, so that men and machinery may be safely employed at all such works as mining, excavation, building, recovering lost valuables, etc., and the structure may be of sufficient size to incase the hull of a vessel or other sunken structure. Means are provided for connecting the working interior portion directly with store-rooms and an ingress chamber with interposed air-locks, and the whole is surmounted with a platform, with means for communicating directly between said platform and the interior of the caisson. The apparatus is provided with ballast-chambers having longitudinal partitions to prevent the ballast from shifting and independent air-chambers, with means for filling or emptying them. It consists of an inverted double-walled shell with intermediate truss-frames, a superstructure fixed upon the top of the caisson having chambers at opposite ends and having interposed air-locks, means connecting one of said chambers with the interior of the caisson, means connecting the other chamber with a platform above the surface of the water, a platform and framework whereby said platform is supported from the caisson above the surface of the water.

HALF-TONE SCREEN HOLDERS FOR PHOTOGRAPHIC CAMERA.—No. 790,290. May 23, 1905. James S. Ditty, San Francisco, Cal. This invention relates to an attachment for cameras and is especially designed for cameras which are employed for the production of half-tones and the like in photo-engraving. It consists of an independently adjustable hinged frame carried upon the camera and movable to vary the space between the screen and the photographic plate. The invention is designed, first, to permit the operator to vary the distance between the screen and the sensitized plate at will, to remove the screen frame and its parts from the plate holder, and the danger of destroying these parts by coming in contact with the solution which will drip from the wet plates which are used. It also makes it practical to photograph both line work and half-tone on the plate, thus giving a uniform stipple over the entire plate or picture photographed.

TELEPHONE CALL ATTACHMENT.—No. 790,684. May 23, 1905. Joseph Harverson and John Mudgett, Santa Cruz, Cal. This invention relates to a telephone call attachment especially adapted for use in central offices to make connection on party lines. It consists of a revolvable mounted toothed disk, connections by which an electrical circuit is intermittently completed by the contact of the teeth of the disk with the contacts of the screen and the contact disk having depression in its periphery, a revolvable shaft, with which the depression is normally coincident, and means including a push member, a bell crank lever actuated thereby, and a pin on the second disk engaged by said lever, for turning the second disk so that its periphery will contact with the revolvable shaft and complete a revolution of itself in the toothed disk.

WINDOW-SHADE ADJUSTER.—No. 790,703. May 23, 1905. William C. Organ, Oakland, Cal. This invention relates to means for adjusting window-shades with relation to the windows to which they are attached, so that such shades may be bodily raised or lowered with relation to the window opening, and by such means the shade may be placed at the top of the window or at such intermediate position of its height and independent of the rolling and unrolling of the shade. It consists of vertical tubular guides fixed upon each side of the lower part of the window frame, rods slidable in said guides having heads at the upper end, a connecting bar by which said heads are united, a cord having one end centrally attached to said bar, a locking pulley in the top of the window frame over which said cord passes whereby the slidable frame may be raised, lowered and fixed at any point, and a shade roller having hearings in the heads of the sliding bars below the transverse connecting bar.

GATE.—No. 791,190. May 30, 1905. Louis Hanson, Cottonwood, Idaho. The object of this invention is to provide certain improvements in hinged swinging gates, by which improvement the gate may be raised or lowered and means provided to adjust it to swing free of snow or other impediment. A suitable latch is provided and means for operating said latch from either side, so that the driver may open and close the gate without leaving the vehicle. It consists in a gate having the hinges, and the posts upon which they are turned, in combination with a catch having a counterbalance plate to the outer gate post, a spring-pressed latch pivoted to the gate, bell-crank levers having their angles pivoted to the gate, a flexible connection from one arm of each lever to the latch and a flexible connection extending from the opposite arm of each lever whereby the latch may be lifted.

UMBRELLA RACK.—No. 791,158. May 30, 1905. Andrew Mikulich, Sacramento, Cal. The object of this invention is to provide a simple, neat appearing, compact, and practical rack of this character which can be manufactured and sold cheaply, which is adapted particularly for use in restaurants, hotels, stores, and generally in places, which can be attached to a wall, post, counter, or other suitable support, and which will occupy very little space. The device comprises a casing provided with a drip-chamber, a coiled spring just above said drip-chamber, said casing having its front extended above the chamber and conforming substantially to the outline of the spring, said casing open at the top and said front provided with a projecting portion adapted to direct the drip from the umbrella into the chamber.



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## Summer Time in Alaska.

Recently there has appeared in these pages a number of interesting illustrations of winter scenes on the Yukon and in Alaska. During the long winters the miners and others make lengthy pilgrimages from place to place by means of sleds drawn by horses or dogs, and transportation by this means is convenient and comparatively inexpensive. As a matter of course the routes chosen for travel by sleds lie along the water courses and lakes, for the mountains are usually so abrupt as to make them impassible barriers to the traveler. With the coming of spring the ice in the rivers breaks up and later the streams are free from ice, and navigation is open for a few months. One of the accompanying engravings shows the appearance of the river during the period of breaking up of the ice. At this time it is not safe to venture to make an extended journey for fear of blockades and ice jams. Another illustration is that of Eagle City, as seen from the bluffs above town. Eagle City is near the international boundary and on the American side. A third engraving gives a good idea of a Yukon river steamer, and the character of the landings at some of the points along the river. These vessels are all flat bottomed and have stern wheels. Many of them have paid for their construction many times over. A glance along the bank



A View on the Yukon Near Eagle City. The Photograph Was Taken at Midnight June 30, 1904.



Breaking Up of the Ice on the Yukon.



View of Eagle City, Alaska, From the Bluffs.



Steamboat Landing at Eagle City, Alaska.

of the river shows the rather frail character of the buildings, but what is more surprising, several cattle as well as horses are seen. At present the most

important gold mining region near Eagle City is on American creek, and its tributary, Discovery Fork. In 1903 a flume was built on American creek having

a capacity to carry 1200 inches of water. The flume was nearly  $1\frac{1}{2}$  mile in length and 150 feet head was available, it being the intention to employ hydraulic elevators, but with the coming of summer it was found that the available water supply was insufficient for the purposes, and during 1904 the plant was remodeled and further experiments tried, to make as effective use of the outfit as possible. Several creeks below Eagle City which are tributary to the Yukon from the west have been worked for several years past with good results. One of the most recent discoveries in this region was the upper basin of Washington creek late in the summer of 1904. One nugget weighed \$168, and there was much coarse gold found. What this new district will develop the present year remains to be seen. There are good prospects opposite Eagle City on the Yukon, but water was found below the level of the frozen ground which rendered efforts to work it abortive, for the time being at any rate. The fourth engraving of this group is most interesting. The photograph from which this engraving was made was taken at midnight on June 30, 1904. At this season of the year at the latitude of Eagle City—about  $65^{\circ}$  N.—it is daylight, and objects can be seen for miles on all sides. A few degrees farther north the sun is in sight at the midnight hour, which has given to this north country the name of "the land of the midnight sun," but the midwinter days are of only a few hours duration.



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J. F. HALLORAN.....Publisher

SAN FRANCISCO, JUNE 17, 1905.

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THE recent decision of Judge Beatty of the United States Circuit Court, denying the injunction against the several mining companies, asked for by farmers in the Coeur d'Alene district of Idaho, has taken a proper and common-sense view of the situation. He correctly concluded his decision by remarking that the granting of such an injunction would result in closing down the mines and the depopulation of the district.

THERE appears to still be, in certain localities, some misunderstanding concerning the effect of forest reserves upon the mining industry. It is not the purpose of the reserve to oust the claim owner, nor to prohibit the prospector from entering the tract set aside as a reserve to carry on his search for minerals. The purpose of creating forest reservations is "to improve and protect the forests within the reservations, or for the purpose of securing favorable conditions for water flows, and to furnish a continuous supply of timbers for the use and necessities of the citizens of the United States." The proclamations setting aside certain tracts as forest reserves provide for preserving the status of mining claims valid and subsisting at the date of the withdrawal of the land from the public domain. The object of the reserve is not, as some think, to antagonize the mining industry, but to protect the timber from destructive fires and wanton waste, in order that it may be used in the industry of mining and otherwise, and also to protect the watershed as far as possible and to secure by this means a permanent rainfall, for it is a well established fact that where the timber has been burned or cut off from large areas the water supply in the lands below, to which such area is tributary, soon fails, and the summer supply is inadequate or disappears altogether. Un-

der such conditions the soil is swept away and the run-off becomes very rapid and the springs soon disappear.

## Value of a Mine Cost Sheet.

A great deal has been done in the past few years to reduce mine account keeping and the preparation of cost sheets to a science, and much that is commendable and useful has been evolved; but, without doubt, the "system" can be carried to a point beyond which it ceases to have practical value. What the mine superintendent wants is a system of cost sheets made up from the office books which will enable him at any time in a very few minutes to arrive at the cost of any particular piece of work which has been accomplished under his direction. It may become necessary to cut out a station and ore pocket at the commencement of operations in opening a new level in the mine. The question arises: "What will be the cost?" He turns to the cost sheet which gives this information for similar work at some higher level. Here he finds the dimensions of the cutting. The amount of materials and their cost is stated—timber, chute doors, track, lights, installation of the bell signal system, labor, drills, etc., explosives and every detail in connection with this work, both above and under ground. If any difference in conditions exist, he should be able to determine what they are and estimate accordingly. By a comparison of several such sheets, which represent the cost of two or more stations, the superintendent may see where the cost of doing the new work may be reduced. The idea applies not only to cutting and equipment of shaft stations, but to every department and class of work about the mine, whether under ground or on the surface. To make the scheme of the cost sheet available and as nearly accurate as possible, the warehouse account must be kept as carefully as that of a merchandising store. Not a rope, nor a valve, a can of oil or any of the many small items, which go to make up the whole, should be given out (much less taken without leave), until a requisition blank has been filled out and filed by the proper person, presumably the storekeeper, showing for what purpose the article indicated is to be used, and where. This is to be signed by the foreman, or stamped "O. K." by the storekeeper, who later submits it to the foreman for verification. These slips are collected from the various departments daily by the bookkeeper and entered in the books. Where some such system is not in use, the loss of fittings and supplies during the year about a large mine would pay several times over for a force of expert bookkeepers and store tenders to look after this branch of the business. There are many things essential to the success of operating a mine beside the foreman's time book, and even the time book should be kept in such a manner that it will show the number of hours of labor put in on any particular class of work. In the mine some of the men (laborers generally) are employed at half a dozen different tasks during a shift. A man may be assisting for an hour in track laying. Then for an hour or two he is required on the air-pipe line, or on the pump, or he may have to help in the mucking gang. Again, he is sent to the surface for some particular purpose, and is thus shifted about from place to place. It makes no material difference in his pay, but neglect to keep account of this division of the laborer's time will make a great difference in the cost, as shown on the books, of any particular operation. It is unsatisfactory to apportion labor costs in the office by guess, as is often attempted.

One of the most difficult matters to keep track of is the proper division of expense of power in operating air drills. The only proper method of arriving at this is to keep as accurately as possible the number of hours each machine is employed on every shift, and to divide the monthly cost for air compression by the number of drilling hours, when the drilling time of each machine may be ascertained by consulting the drill sheet and the proper charge made. By this means the cost of drilling operations may be very closely arrived at. In drilling cost must be included deterioration of machines, repairs, lubrication, and blacksmithing on drill bits, cost of steel, etc. These charges, together with labor, explosives, timber, tracks and ventilation, make up the main expense of the various mining operations. Superin-

tendence and general expenses must also be considered, but these are incidental and cannot be avoided. The more extensive the operations are the less the general expense charge should be against any particular work in the mine.

## Steel in Mill Construction.

The disadvantage in not employing steel and sheet metal in the construction of mills was again illustrated in the complete destruction of the large cyanide mill of the Horseshoe Mining Co. at Terry, S. D., a few days since. The building caught fire in the crusher department and spread so rapidly that it was impossible to save the structure or any part of it. The mill cost nearly \$500,000, and was insured for about one-half this sum. Undoubtedly the first cost of a steel structure would be much higher than one built of the native Black Hills lumber, but, had steel been employed, the building would have been still standing, and heavy insurance premiums, as well as the loss, would have been saved.

Several years ago the Deadwood & Delaware smelter burned, when the plant had been completed and was doing a satisfactory business—handling 400 tons of ore daily. The smelter was rebuilt of steel with double this capacity, but this did not save the loss of the cost of the plant destroyed. About a year ago the Val Verde smelter in Yavapai county, Arizona, was completely destroyed by fire, and, in addition to these, there have been numerous other serious fires of reduction works, all of which might have been prevented had the structures been of steel. Even more serious are the fires of shaft buildings, where the fire is likely to be communicated to the timbers in the shaft, as was the case when the hoist at the Union mine at Virginia City, Nev., burned last summer. Steel has been successfully used in the construction of head frames and also of mine buildings, and the sooner the practice becomes universal the better for the industry.

## Market Value of Mines.

An Eastern financial paper recently published a table giving the names of a number of important copper producers in the United States—their annual production in pounds, the present selling value of the stocks of these properties in the market, and the market capitalization per pound of copper produced. Of what value such a compilation can possibly be is not apparent, as there is actually nothing of value that may be derived from a careful study of such a table other than the incidental ratio shown by the figures. In the first place the amount of copper produced by any particular mine does not indicate that an arbitrary percentage of this value is disbursed in dividends, for it is not always the largest producer that makes the greatest percentage profit. Obviously a mine yielding 20% ore will be enabled to pay a larger proportion of its earnings in dividends than one which produces a 4% ore, even though the latter be one of the heaviest producers in the country. Another reason why such comparisons are of little value is, that the output of a mine for this year is not a safe index of its ability to produce next year. It may by increased development be enabled to greatly exceed the present output, or the ore bodies may become exhausted and the mine cease to produce altogether. The comparison of these several copper-producing properties above referred to is interesting, but of no real value in determining the present or the future value of these mines.

FROM almost every mining State and district comes the news of the reopening of old properties, or the development of new ones, while expansion in operations appears to be the rule with active, going concerns. Mining has come to be looked upon by conservative business men as a perfectly legitimate and safe business, when honestly conducted—a distinction which it did not enjoy a few years ago. The present attitude toward the mining industry on the part of conservative investors is largely due to the safeguards thrown around it by the responsible mining engineers. The experience of years has abundantly demonstrated that mining operations may be conducted with as much safety, viewed from a financial standpoint, as may be found in any other industrial pursuit.



## CONCENTRATES.

CONCRETE can often be used to good advantage at the collar of a mine shaft and sometimes underground.

IN laying mine tracks of T rails it is customary to place the joints of the rails between the sleepers, and not upon them. This usually gives better satisfaction.

WHERE a dump of mineral or waste, whether containing values or not, are left indefinitely on the land of another, it becomes the property of the owner of the land.

A LESSEE has the right to all minerals in the dump created by his labors during the term of his lease, but not afterward, unless specifically otherwise expressed in the lease.

THE pressure on the inner face of a dam is normal to that face, whatever the slope angle may be. On a face standing vertical the pressure is horizontally outward, on one sloping backward at 60°, the direction of pressure is downward at an angle of 30° from the horizon.

COPPER GLANCE is not readily soluble in dilute solutions of sulphuric acid, and any attempt to treat this class of ore by leaching would probably result in failure. The percentage strength of acid used in leaching oxidized copper ores depends upon the amount of copper present.

THERE are three types of flume construction, viz: the rectangular flume, the "V" flume and the V flume with flat bottom. To V flumes are sometimes added vertical sides to prevent the overflow of water from "jams" where the flume is used as conveyor of lumber, wood, or other material.

IT is not good practice to make a saw cut on mine timbers for the purpose of lining up, for in the event of this timber being subjected to pressure it is very likely to split at this cut, as it is weakened by it. It is not uncommon to see the under side of caps for drift sets and the wall plates of shafts scored in this manner.

SAWS used in marble and other stone cutting are not provided with teeth, but are simply bands of steel with unserrated edges, the cutting of the stone being accomplished by feeding sand and water under the saw. These saws are usually arranged in groups or gangs, so that several cuts may be made at one time, thus lessening the expense of cutting.

THERE is no reason why a brick or stone stamp mill may not be erected and run for years without excessive deterioration. Brick mills, built in 1877, were run for years without injury to the walls from the jar due to the falling stamps. It is necessary to have substantial foundations under such walls. A frame mill will not endure on insecure foundations.

EXCELLENT PERMANENT MARKS for the use of the mine surveyor are made by drilling a hole in the roof of the drift or other opening and driving into it a wooden plug. Into the plug at the precise spot should be driven a horse nail, through the flattened head of which has been bored a hole, into which a hook on the plumb-bob string or the string itself may be secured.

THE first patent issued by the United States Patent Office was on July 28, 1836. During that year a total of 109 patents were issued. During 1904, the number of patents issued was 30,267, a total to the first of January, 1905, of 748,567. This number has been since increased up to June 6, 1905, to a total of 791,992. At the present rate the number of patents issued during the calendar year, 1905, will exceed 80,000.

IT is not impossible for strata of limestone to lie between granite and greenstone. Such a condition is possible where the limestone has been intruded or uplifted by the granite with the subsequent intrusion of a greenstone dike which lies now on the hanging wall side of the limestone. Where intrusive rocks are forced into sedimentary strata, almost any kind of complication of geological structure may result.

IN working an ore body or vein up to a property line, the work of mining must be done in such manner as to prevent the caving of the adjacent ground of another proprietor into the mine workings thus made. The damage occurring from the undermining of the surface of another's property, where the surface has settled by reason of the removal of the ore or mineral, may be recovered by the injured party in a suit at law.

A ROCK DUMP 200 feet long, with a base of 130 feet and height of 30 feet, with a horizontal top cross section of 10 feet lying on a flat surface, will contain about 22,000 tons of material. It would cost to load this into cars by hand shoveling about \$3000, but various inexpensive devices can be arranged to load the greater part of the rock without shoveling, thereby reducing the expense from one-third to one-half. If a very large amount of

material of this kind is to be moved, it would be economy to put in a steam shovel.

THE vein of the Granite Mountain mine, near Philipsburg, Mont., occurred as a fissure at contact of granite and metamorphic sedimentary rocks, and the Drummond mine, near Marysville, at contact of schists and a mass of diorite. Some of the silver-bearing ores of the Butte district in Montana are wholly in granite. Many silver veins are in limestone, in andesite, rhyolite and a great variety of other rocks, both sedimentary and eruptive. Some of the sedimentary rocks are not even metamorphic, as at Silver Reef, Utah.

THE right of a mine owner to dump waste rock or ore on the lands of a lower proprietor has never been passed upon by the Supreme Court of the United States. It has been held, however, in one case (Equator Co. vs. Marshall, U. S. C. Court, Colorado), in an action brought to restrain defendant from dumping on lower ground of plaintiff, that as no actual damage was being done, no work retarded, shafts filled up, life endangered, or other gross or material injury inflicted, the remedy lay in a suit at law for damages if any damage were done.

ALTHOUGH multiple ropes are common on the elevators used in buildings, "Concentrates" knows of no instance where two or more ropes are used in mines for hoisting a single cage or skip. The system of winding in building elevators and in mines is entirely different. In the former the sheave is at the top of the shaft and the winding engine is at the bottom. In the latter the hoist is at the surface and the cage or skip is hoisted from below. The principle involved is similar in both, but it has not been considered advisable to employ multiple ropes in shaft winding, and in deep shafts it would be impracticable.

THE counter weight on the flywheel of a rock breaker, or on any other piece of machinery, is placed opposite the eccentric, or crank pin, as the case may be. The theory of the counter weight is to place a mass of metal equal in weight to the weight of the crankpin, cross-head and a portion of the connecting rod, at a point opposite this weight, or in the case of an eccentric opposite it. The instructions usually sent out by the manufacturers of rock breakers is to key the flywheel to the shaft according to marks made on the shaft. It is immaterial in which direction the flywheel revolves. The counter weight on either wheel should be opposite the eccentric.

THE small triangular projection seen at the apex of nearly every oil derrick is a device by means of which the drill hole is centered directly beneath the periphery of the crown wheel over which the cable supporting the tools passes. In the operations of drilling, drawing casing, and by other means, the derrick is often racked somewhat, which, owing to the height, carries the crown wheel out of direct alignment. This is detected by dropping a plumb line from the apex, when the derrick is "jacked" back into place, for if drilling be continued without taking this precaution the drills are likely to be deflected from a true vertical direction and the hole lost.

THE placer deposits found in some portions of California are very often not derived directly from the veins of the neighborhood, but may have been deposited and redeposited a number of times. There are instances where the gold in a placer mine is known to have been redeposited at least three times, and possibly in some instances a greater number. An instance may be mentioned occurring near Mokelumne Hill, in Calaveras county, where the gold originally derived from the auriferous veins was deposited in an ancient channel of the first period, which was subsequently cut by channels of the second and third periods, and the latter, exposed by recent erosion, formed a placer in a gulch, where it was mined in the early days. Here is an instance of gold having been deposited in a placer four successive times.

THE owner of a mining claim, patented or otherwise, upon discovering that the vein located passes out of the side line, may locate the extension of the vein on an adjoining claim, through the medium of a discovery made in driving a drift on the vein from the first claim into that located later, and if the original locator claims that assessment work for the second claim was performed in that first located, and can prove that such work was for the benefit of both, he may hold both claims by doing all the assessment work in the first claim. Sinking a shaft in this location might be claimed as development for the benefit of both. If B, thinking that A has abandoned the second claim, undertook to relocate it, he must make a discovery from the surface, in which A has the advantage of B, for the latter cannot claim A's discovery on the second claim, because he can only do so through becoming a trespasser on A's first claim. B must sink through the "wash" and make a bona fide discovery on the second claim, if he wishes to attempt to initiate title to A's second claim, and even then he runs the risk at first pointed out, that of having A say that he had no intention of abandoning this claim and did his assessment on the adjoining claim. Assessment work may be done on a patented claim for the benefit of an adjoining unpatented claim.

IT is not necessary to have double-tread rear wheels

on a skip to make it dump automatically if the skip is of proper construction. The side bars of the skip should extend well toward the bottom, or to the bottom, or lower end of the skip. All wheels may be of the same size and pattern (the ordinary flanged skip wheel). At the point of dumping the track turns from the incline of the shaft to a horizontal direction, and extends toward the rear from 4 to 8 feet or more, depending upon the length of the skip. When the forward wheels reach the horizontal section, which is approached by curving the rail from the incline, it runs forward on the horizontal section until it is stopped by a bumper. Meantime the rear wheels are lifted from the track by the continued pull of the rope, when, as the proper angle is attained, the contents of the skip are discharged into the bin beneath. The engineer releases the reel and the skip drops backward, the rear wheels striking the track and the vehicle descends into the mine. With a careful engineer there is neither danger nor difficulty. This device is in operation at scores of mines and has been for years. An elaborate device for dumping such as is often seen is not necessary. The above described scheme for automatically dumping skips has been also successfully applied to vertical shafts, but in such cases it is very important that the skip shall not be overwound or the skip will dump a portion of its load at least into the shaft.

THE rise in temperature in compressing air in the usual types of compressors found in the mining regions can be greatly reduced in most cases if the air be conducted to the compressing cylinders from the outside open air, instead of within the building, as is most commonly the case. The freezing up of an air pipe line during cold weather is due to the moisture in the air, which congeals, clogging the pipe. To obviate this difficulty a sort of condenser called an "aftercooler" is made through which the air passes, the moisture being condensed and settling to the bottom of the aftercooler from which it may be drawn off. If desired, the air, now comparatively free from moisture, may be reheated for use. A large-sized air receiver, situated 20 or 30 feet from the compressor, has a tendency to take a large percentage of moisture out of the atmosphere. Where the pipe line from the compressor to the point of use is long—over 1000 feet—it is good practice to put in a second receiver. It not only extracts more water from the compressed air, but gives a larger volume of air upon which to rely in case of a sudden unexpected stoppage of the compressor. At some mines having air-compressing plant, with water or electrical power, and steam (usually the original plant) as auxiliary, the air line is connected with the boilers when not otherwise in use to give greater capacity to the air plant.

FOLLOWING are tests for antimony (Sb.): Heated on charcoal before the blowpipe with sodium carbonate, antimony compounds are reduced to beads of gray, metallic, brittle metal, easily oxidized, and forming a white sublimate of antimony oxide on the coal, at some distance from the assay, coloring the flame greenish; the fused bead on removing the flame burns, forming crystals of oxide of antimony. The detection of the presence of antimony when in small quantities in an ore is a difficult and delicate operation, which requires considerable chemical knowledge and apparatus, and the same may be said of manganese when occurring in small quantities. If it occurs as black oxide it can usually be seen without difficulty. If as the carbonate or silicate, the mineral may also usually be seen. The oxides are black and often soft. The carbonate (rhodochrosite) is brittle, soft (3.5 to 4.5), luster vitreous, inclining to pearly, colors rose red, yellowish gray, dark red and brown, streak white, faces of crystals striated. The silicate of manganese (rhodonite) is often crystallized, with rounded edges, very common in tabular form, commonly massive. It often occurs as embedded grains; hardness 5.5 to 6.5; very tough when compact; luster vitreous, and on cleavage faces pearly; color light brownish red, flesh red, rose pink, sometimes greenish or yellowish; streak white.

QUARTZ CLAIMS may be located in the Dominion of Canada (which includes British Columbia) under the following laws and regulations: Persons of eighteen years and over and joint stock companies holding free miner's certificates may obtain entry for a mining location. A free miner's certificate is granted for one or more years, not exceeding five, upon payment in advance of \$7.50 per annum for an individual, and from \$50 to \$100 per annum for a company, according to capital. A free miner, having discovered mineral in place, may locate a claim 1500x1500 feet by marking out the same with two legal posts, bearing location notices, one at each end of the lode or vein. The claim shall be recorded within fifteen days if located within ten miles of a mining recorder's office, one additional day allowed for every additional ten miles or fraction. The fee for recording a claim is \$5. At least \$100 must be expended on the claim each year or paid to the mining recorder in lieu thereof. When \$500 has been expended or paid, the locator may, upon having a survey made, and upon complying with other requirements, purchase the land at \$1 an acre. Permission may be granted by the Minister of the Interior to locate claims containing iron and mica, also copper, in the Yukon Territory of an area not exceeding 160 acres. The patent for a mining location shall provide for the payment of a royalty of 2% of the sales of the products of the location.



Chinese Methods of Mining Quicksilver.\*

Written by HENRY BRELICH.

The following notes refer to quicksilver mining in one of the remotest provinces of China, and, in addition to giving some insight into the habits and peculiarities of Chinese miners—points of vital importance to those who employ them, either in China or elsewhere—shows how their simple wants and cheap mode of existence enable them to make a living by mining low-grade ore in the most antiquated way, and smelting it with the most primitive appliances.

The Wan Shan Chang mines are the principal and most extensively worked deposits of quicksilver in Kweichow, and are representative of the conditions prevailing in other parts of the province—such as Pachai, Beh Mah Tung and Wuchuan. They are situated in the Prefecture of Toon-Yen in the province of Kweichow, about latitude 27° 30' and longitude 109° 0' E., at an altitude of 3000 feet above sea level.

The principal route to the mines is from Shanghai, along the Yang-tze-Kiang to Shasi, 903 miles, which is covered by river steamers, thence by junk along one of the numerous canals, and skirting the north-west corner of the Tung Ting lake, to the Yuen river, which is followed to SENCHI, 315 miles. From SENCHI the Mayang river, a tributary of the Yuen, is followed to Toon-Yen, 85 miles, thence overland to the mines, 21 miles. The journey may be accomplished under favorable conditions in twenty-five days.

The mines can also be reached by continuing the journey from SENCHI along the Yuen to Huang Chow, 195 miles, and then overland to the mines, 13 miles.

The distance of the mines from Shanghai is 1324 miles and 1426 miles, respectively, by these two routes.

The country in the immediate vicinity of the mines forms a nucleus whence several canyons radiate to the east, north and west. Southwards in the direction of the Yuen river, numerous conical hills with rounded tops and steeply inclined sides covered with shrub, and separated by narrow, tortuous, culti-

beds which have, in most cases, undergone considerable local disturbance.

There are two varieties of cinnabar which constitute the ore. One is a bright transparent red, the other a dark opaque red with which antimony is almost invariably associated in small quantities. The former is known as the "red," and the latter as "black" cinnabar. Pyrites is entirely absent. Native mercury is occasionally associated with antimonial ore.

**HISTORICAL.**—No authentic information can be gathered regarding the time when mining was first begun here. The landowners, who may be regarded as the descendants of the oldest families, claim that their ancestors carried on mining during the Ming dynasty (1368-1644 A. D.), but, beyond this rather vague statement, no data whatever can be obtained.

Previous to the introduction of gunpowder by Szechuanese miners some thirty years ago, mining was carried on with the hammer and gad, and in the larger workings by "fire setting." This mode of mining, as also the introduction of powder, is well remembered by the old inhabitants.

**POPULATION.**—The mountainous country surrounding the mines is sparsely populated when compared with the more fertile parts of the river valleys; and the number of inhabitants of Wan Shan Chang, within the area wherein the deposits of ore occur, which includes those in the mining villages and farmsteads, is estimated not to exceed 10,000.

The inhabitants may be divided into two distinct classes—mining and agricultural. The former are

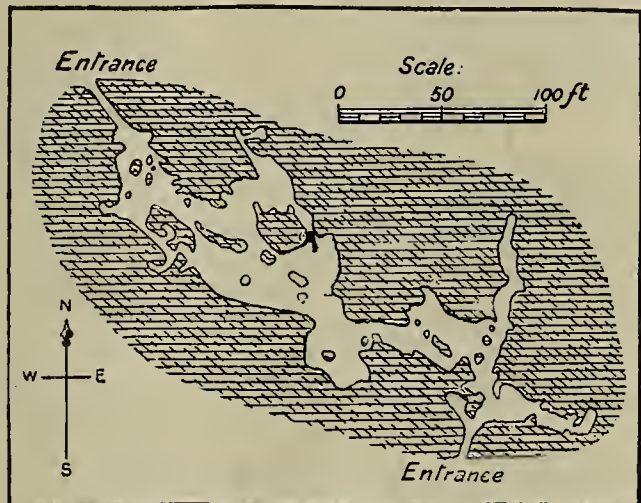
the huge mine dumps both inside and outside the mines.

The "ore pickers," as they are locally termed, are mostly lads, women and children, who may be seen wending their way in small gangs to the mines from a distance of 2 or 3 miles at all hours of the morning, armed with basket, hammer, rake and lamp, returning to their homes in the evening with ten to fifteen pounds of picked ore each, assaying 1% to 2% Hg, which is the usual amount gathered in a day's work.

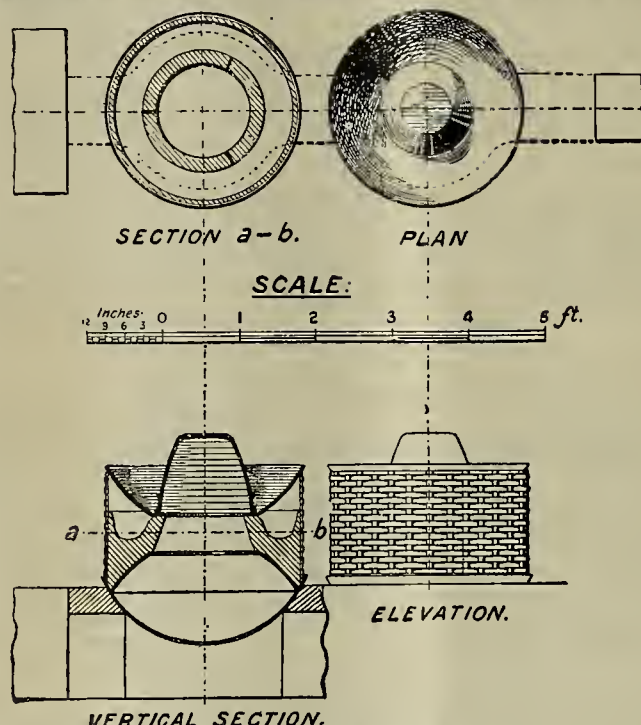
**METHOD OF WORKING.**—The method adopted for winning the ore is to follow the mineral wherever it occurs, with an entire disregard for the most elementary rules of mining, which naturally results in a series of workings, intricate and tortuous beyond description.

The miner follows a stringer or leader on a mineralized band of ore, enlarging the working place to such an extent only as to enable him to work. In Fig. 1 is shown an old working said to have been abandoned some sixty years ago, where the ore from an irregularly mineralized bed of limestone 1 foot 6 inches thick has been completely removed by hammer and gad, the working averaging 3 feet 6 inches in height. The fact that the deposits are not deep-seated, and that the deeply carved and fissured country does not permit the accumulation of large quantities of water in the workings, has enabled the natives to carry on mining in their primitive ways without receiving the serious check which would have compelled the entire suspension of mining operations.

During the rainy season, the surface water which



Plan of a Chinese Quicksilver Mine.



Chinese Quicksilver Reduction Furnace.

vated valleys, form the principal features of the country.

The climate, though moist, is fairly healthy, and epidemics, which are so prevalent in many parts of China, have never been recorded here. The natives suffer mostly from fever, which, however, is frequently of a more severe type than ordinary malaria.

The rainfall and temperature is shown in the following table:

Date.	Average Max. F.	Average Min. F.	Rainfall. Inches.
1901.....	63.33	51.91	57.73
1902.....	66.51	54.84	48.39
1903.....	63.41	52.41	55.70

**ORE DEPOSITS.**—The predominating geological formation is magnesian limestone lying in almost horizontally stratified beds, which attain a thickness of several hundred feet, and extend over a considerable portion of this and the neighboring provinces.

The quicksilver deposits are scattered over an area of, roughly, 3 square miles, isolated and irregular in shape, and occupy a distinct zone in the limestone, those near the rim of the canyon being the most extensive and most productive, while the numerous smaller ore bodies, which occur some distance away from the canyon, are, with one or two exceptions, insignificant, and would probably have remained untouched in any other country as too poor for remunerative exploitation. The ore occurs:

1. Impregnating well defined beds of limestone.
2. Along the joints, cracks, and planes of stratification.
3. In isolated bunches, nests or pockets, and in vughs or cavities which contain crystalline aggregates or well developed crystals of cinnabar in the form of penetration twins of two rhombohedra associated with quartz and calcite.
4. Irregularly disseminated through a number of

constantly engaged in mining work, and depend for their living solely upon that source, although some at harvest time render assistance to the farmers. They work irregular hours of the day or night, according to their disposition, and are in no way bound to adhere to any methodical routine of work, which, by the way, is never practiced by the Chinese. Their meals, taken twice a day, consist principally of rice with vegetables, and more seldom pork, washed down by copious draughts of water, which is sometimes replaced by tea. Gambling and opium smoking form their only recreations, and there is but a very unimportant minority who do not indulge in both these, their favorite and ruinous pastimes.

The conditions underground are the worst possible; the workings are badly ventilated, and the air is made more foul by many of the men who live in the mine, fearing that their ore will be stolen if left without being watched. The oil used in the lamps burns with a lurid, smoky flame, the gases generated by the combustion of powder on firing remain in the workings and are inhaled by the miners, who, immediately the shot is fired, rush to the face to prevent others from stealing the ore.

Entirely ignorant of the simplest rules to be observed in regard to their bodily welfare, they are thus continually subject to the many injurious influences which surround them, resulting in this community being reduced to a most deplorable condition of health and suffering many ailments—the most prevalent being disease of the lungs. The stronger and healthier rural population of the surrounding country, whose constant work is in the fields in a comparatively healthy climate, contrast markedly with the mining class. They seldom seek employment in the mines, but during the winter months, when there is no demand for their labor in the fields, they devote a portion of their time to picking ore from

accumulates in the lower workings is forked by means of bamboo or wooden chain pumps, similar to those used for irrigation purposes. If the water cannot be coped with, the working is abandoned for the time being, and work resumed during the dry season. Timbering is unnecessary, the ground being compact and holding up well, even in the largest working.

Foul air due to the absence of ventilation is considered of no account, and men are often at work where, without approaching it closely, the smoky flame of the lamp can only be distinguished with difficulty.

The men will submit to constant discomfort in preference to executing any work which causes expenditure and is not directly remunerative. The ore is mined in the ordinary way by drilling holes, seldom beyond 15 inches deep, with  $\frac{3}{4}$ -inch iron drills pointed at both ends with steel. The holes are charged with two or three ounces of gunpowder by first inserting the pricker in the hole, then the powder, which is tamped with an iron rod, the tamping of clay or finely crushed rock, filling the hole almost to the rim. A pointed bar is inserted in the eye of the pricker, which is loosened by twisting and removed. The fuse is inserted in the space left by the pricker, and a conical shaped piece of paper is placed at the end of the fuse, which, after being lighted, smoulders, and acts as a time fuse until it reaches the powder.

The principal ingredients of the powder, niter and sulphur, are products of the province, and the explosive is made at the mine under circumstances which frequently lead to fatal injuries to those preparing it. Owing to the defective mixing of the three ingredients which constitute gunpowder, and to the inferior quality of the niter, the explosive force is not great, and an average shot breaks, roughly, 100 to 200 pounds of rock.

The mines may be classed as "private" mines,

\*Trans. Ins. Min. & Met.



acquired and worked by so-called companies, and "public" mines, worked by individual miners. In the private or company's mines the men are employed (a) on day's wages; and (b) on tribute.

In the first case the miners have to sharpen their own drills before going into the mine, and drill and fire two holes each about 15 inches deep, this being considered a day's work. They drill single-handed with hammers weighing six to seven pounds, one back hole counting as being equal to two down holes, while uppers they are unable to drill.

The men work on an average five to six hours per day, but no work is done on every fifth day, which is market day and also pay day, when they receive 400 cash (about 1s), in addition to the two meals, costing 50 cash (1.6d), with which they are supplied daily.

Overtime is paid for at the rate of 40 cash (1.2d) for each hole drilled in excess of two.

Thus, a miner working on day's pay earns, inclusive of his food, 130 cash (4.2d) per day, and makes at the most twenty-four hours in five days.

When working on tribute, the company assigns a portion of the mine to one or more men, who supply their own tools, explosives, etc., and are allowed to work without any restrictions, on the understanding, however, that the ore mined is to be retorted in the furnaces of the company, who retain a certain percentage of the quicksilver—i. e., the amount collected in the annular space of the furnace through the percentage holes, to be described later—and purchase the mercury produced at a stipulated figure lower than the market price.

The percentage holes are so arranged in the different furnaces that the amount of quicksilver varies from 20% in the case of poor ores to 40% in the case of rich ores.

The company pays all the taxes to the officials and landowners, howsoever the mine may be worked.

The public mines are mostly old workings which have been abandoned as too poor to be worked by a company, but still rich enough for individual miners, who, on payment of a "hammer" tax of 600 cash (1s 7d) per month to the local magistrate, are allowed to work in any unoccupied mines within a limit, vaguely defined, "of 10 feet." If the ore is won in sufficient quantities, the landowner establishes a furnace near the mine, and the miner is compelled to have his ore treated in it, the owner retaining the usual percentage collected through the percentage holes, which is seldom, if ever, below 20%.

**TREATMENT OF ORE.**—The ore is sorted in the mine, and brought to the surface in bamboo baskets of a capacity of thirty to forty pounds, fastened on the back of the carrier by ropes, which pass under the armpits. It is then cobbled and picked, and as much as possible of the barren rock removed, and after detaching any large crystals of cinnabar with a pointed piece of stout wire, it is crushed to pass a  $\frac{1}{2}$ -inch bamboo sieve, and if the cinnabar is of the "red" variety the crushed ore is panned and the clean cinnabar (concentrate) removed, and the tailings treated for quicksilver in the retort furnaces.

(TO BE CONTINUED.)

### Testing Safety Devices.

TO THE EDITOR:—On page 230 of May 27th, referring to the article "Testing Safety Devices," I do not see the necessity of cutting loose the cage or skip and letting them go to the bottom of the mine. I have tested these appliances for many years and my method is as follows:

The first of each month, before the shift goes into the mine, I have the cage raised above the floor level; two pieces of timber, 8x8 inches, are placed under the cage and across the shaft, of course resting on the floor. The cage is lowered onto these and the bolt taken out of the clevis; a piece of  $\frac{1}{4}$ -inch hemp rope is tied between the bolt and the drawbar to the cage. The cage is now raised 1 or 2 feet from the floor and the hemp rope is severed with an ax.

The safety device is kept well cleaned. I use gasoline freely at this time, after the test, to cut all gum from the bearings, and then oil them a little with a good oil that will not gum. I have made this test many times and I have never had the cage drop more than 2 inches—in fact, it does not drop 1 inch. I see to the good working of the cage myself. I leave it to no one, and I want all the bearings very free.

I think the binding of the safety devices is usually due to the making of the cages, especially the working bearings, too tight. This work is often done in the factories by men of no experience in mining, and they make the fits all alike. The bearings of the cam shafts and the fit of the draw bar should be a very easy fit. No harm if they shake  $\frac{1}{8}$ -inch—in fact, I prefer them so; but I do want the best of stock in them. Another cause of these accidents is the use of oil too freely on these parts and never cleaning out the gum formed. This, together with a tight bearing, will surely send the cage to the bottom when the rope breaks.

Cages and skips get racked badly by frequent hard drops on the chairs, catching in the guides, and by side strains when handling heavy weights. If the cam shafts are a close fit, they are bound tight by such racking out of shape of the cage and are rendered useless for the service they are intended for.

The bearings of chairs should also be made a very

loose fit. They are usually made as if they were to do service as a line shaft. Such parts of machinery as are placed in damp places and at times covered with dirt, handled and taken care of by men that know practically nothing about machinery, should be easy fits. I know that some superintendents, buying machinery for a mine, think, if they see "slobbering" fits anywhere, they are getting poor machinery; but, if a firm understands the use the machinery is to be put to, they will be careful and make their fits according to the requirements.

For the rope fastenings to the cage I prefer good, heavy wrought iron clamps—four or six, according to the weight they are to carry. I want the bolts to be made of Norway iron and two nuts to each bolt. At the time I am making the test of the safety devices I tighten the nuts to the clamp bolts. It is surprising how one can turn these nuts every month, even after several years work, and when gone over every month I have found them a little loose, especially after a heavy lift, such as raising the "sinker," when a heavy one.

I think it a good plan to cut a little off of the rope every little while, if only 2 feet; at this time the clamps should be well cleaned and the bolts cleaned from all dirt and grease; use a little gasoline or coal oil and look over the threads; see they are a good fit. I want these nuts to turn all the way on with a wrench—not a fit that will allow of their being turned on with the fingers; such nuts work loose easily. Give plenty of stock in these parts. ARTHUR HENDEY.

Jerome, Ariz., June 10.

### The Extension Sluice in Dredging.

Those seeking a means of distributing tailings from dredging operations so as to leave comparatively level land in the wake of the dredger can find a means to that end in employing an extended sluice, such as is shown in the accompanying illustration. The tailings stacker handles the debris from the screens without difficulty and is said to be generally satisfactory to the managers of the numerous dredging



The Extended Sluice in Dredging.

plants; but the stackers leave unsightly piles of cobbles, which are stacked up in rows or isolated hillocks, rendering the land practically useless for a greater or less period. Undoubtedly, the gold generally obtained in dredging operations usually renders the land more valuable for mining than for any other purpose, and yet there are places where it may be not only expedient but desirable to leave the land after dredging a comparatively smooth plane, which will quickly become covered with the fine silt from neighboring rivers, deposited during the flood period. In a few years—perhaps four or five—the land is again tillable and may be once more used for agricultural purposes. The illustration shows the simplicity of the construction and operation of the extended sluice. It may be swung from side to side, and all material discharged over it is deposited so far away from dredging operations at the front end of the boat—in the larger dredgers nearly 200 feet—that there is little likelihood of the tailings interfering with the operation of the buckets.

The leveling of tailings after a dredger is largely a matter of sentiment, for the value of the land reclaimed after dredging is only a small part of the value of the gold recovered from a profitable claim; still there may be those who desire to leave their tailings dump level ground, instead of in piles of cobbles, and this device, which is attached to a dredger in New Zealand and taken from the New Zealand Mines Record, shows how this may be accomplished with comparatively small expense in capital outlay and in manipulation of the sluice.

### Reprecipitation of Gold From Cyanide Solutions and Absorption of Gold by a Wooden Vat.\*

Written by A. N. MACKAY.

The following notes may be of interest, as the writer has seen no mention of similar phenomena in any of the technical journals:

1. In the first case of reprecipitation, a vat of pyritic concentrates obtained on Wilfley tables, carrying about 30% pyrites,  $\text{FeS}_2$ , and worth about ten ounces per ton, had been put under treatment; but apparently it had been very much neglected, for it assayed eight ounces when the writer took charge, four months later.

It was decided to turn over the material for aeration purposes, and to do so a trench was cut through the concentrates from top to bottom, and samples were taken of the "faces" thus exposed for each foot of depth and assayed with the following results:

	Ozs.	Dwts.	Grs.
Sample of top foot	0	12	0
Sample of middle foot	2	8	0
Sample of bottom foot	17	8	0
Sample from top to bottom	6	2	0

This showed that the gold extracted in the upper part had been reprecipitated in the lower. Another "face" was then sampled every 6 inches in depth, giving the following results:

	Ozs.	Dwts.	Grs.
Sample of top 6 inches	0	11	0
Sample of next 6 inches	0	17	12
Sample of next 6 inches	1	0	0
Sample of next 6 inches	5	8	0
Sample of next 6 inches	16	2	0
Sample of bottom 6 inches	33	0	0
Sample from top to bottom	9	6	0

Washing the average sample with water reduced the value to 8 ozs. 8 dwts., while the sample from the bottom 6 inches was reduced in value to 30 ounces; a rough amalgamation test on the latter sample showed that the value could be brought down to 19 ounces.

This showed conclusively that the reprecipitation had taken place in the lower levels. The chief cause

seems to have been the use of a too alkaline solution with a too slow percolation rate, the excessive alkali having time to act on the pyrites forming soluble sulphides, which destroyed the cyanide and liberated the gold; probably, also, failure to keep the concentrates covered with solution allowed the formation of sulphates, which may have helped in the decomposition of the cyanide.

It may be of interest to add that by "turning over" twice and circulating a .25% solution very rapidly, the value was reduced to 15 dwts., below which it refused to go; the material was then fed into one battery box in small lots each day and sent, without concentration, to the sand vats. An increase of 3 grs.—6 grs. in some cases—in the residue values was noted in those vats into which it was sent, from which it was calculated that the pyrites had been reduced in value to between 3 dwts. and 4 dwts.

In the second case, reprecipitation took place from a .020% solution which constituted the circulating water used in the battery, etc., which, after leaving the sand separation vats, passed over spitzkasten to settle out the slime, and thence returned to the feed-water tanks. Its gold contents were 3 dwts. to 4 dwts. per ton. The slime-sludge settling in the spitzkasten was run into by the agitators and a sample of this sludge was taken very frequently—every ten minutes or so—and put into a bucket; when complete it was well mixed and a portion put through on a fil-

\*Trans. of Inst. of Min. and Met.



ter pump for assaying. As a general rule, this was done immediately the sample was ready; but, by chance on one occasion, it was allowed to stand overnight and unaccountably showed an increase from normal values. Reprecipitation was suspected, and the next also was allowed to stand, samples being taken out at regular intervals. The slime and solution being assayed, the results were:

Time.	Slime			Solution		
	Ozs.	Dwts.	Grs.	Ozs.	Dwts.	Grs.
2 P. M.	0	4	0	0	3	6
6 P. M.	0	4	18	0	2	18
10 P. M.	0	5	12	0	1	21
8 A. M.	0	7	0		Trace.	
5 P. M.	0	7	0		Trace.	

Thus it was shown that complete precipitation had taken place in about eighteen hours.

The protective alkali was about equal to .04% KOH per ton of solution, and it seems probable that this alkali had acted on the fine sulphides in the slime—about .5% FeS<sub>2</sub>—forming alkaline sulphides, which destroyed the cyanide.

This, however, could not very well take place in the agitators, as the cyanide was added while the agitators were filling; but a few test cases were made in which (1) no cyanide was added till the agitator was full; (2) agitation was stopped and no cyanide added till the agitator was full. In both cases an increase in residue values was always observed, the second case showing on an average about 3 grs. worse than the first, which was itself 6 grs. worse than normal residues.

The cyanide in the whole works was reduced considerably until the alkalinity was only .01%, at which point no reprecipitation occurred. The cyanide then in use was that showing 104% KCN and 10% KOH, under the circumstances the worst possible, for the water from the mine had an alkalinity of about .03%.

2. A wooden leaching vat, which had been used for treating by percolation the "sands" of a roasted sulpho-telluride ore, had to be dismantled when a change in the treatment was made. Some pieces of the wood were carefully cleaned and incinerated and the resulting ashes assayed, and the cocoanut matting and the Hessian used in the filter bottom were similarly treated, the values as calculated back to per ton of original being:

	Ozs.	Dwts.	Grs.
Wood	12	8	0
Hessian	3	12	0
Matting	5	14	0

The wood was a variety of red pine and had been in use about eighteen months, treating in that time about 1200 tons of an average value of 20 dwts.

The values in the matting and Hessian may be due to very fine particles of ore in them which could not be beaten out, or may have been caused either by insufficient water washing or by the use of unsuitable water, for a white incrustation found on the joints of the timber, consisting of chlorides, sulphates, carbonates, etc., of sodium, calcium and magnesium, assayed 7 ounces, the water in use carrying 10% or so of solids in much the same composition.

## THE PROSPECTOR.

The rock samples from Reno, Nev., are: No. 1, tourmaline rock. It is of no value, but it would be well to carefully prospect the vein or dike from which this rock came for cassiterite (the oxide of tin), as tinstone very commonly occurs in association with this rock. It may occur in finely disseminated grains of grayish, brownish or black color, with a bright, pearly luster. The tinstone, if present, can be readily separated from the tourmaline rock by panning. No. 2 is very much altered and difficult to determine. It has the appearance of being a quartz-bearing andesite (dacite), much altered, the feldspars having become kaolinized and somewhat silicified. No. 3 is a siliceous ironstone carrying chalcocopyrite (iron-copper sulphide), iron-copper glance, and malachite (green copper carbonate), the latter incrusting in thin scales. This is a fairly good copper ore.

The samples from Empire district, Nye county, Nev., are difficult of determination. The light-colored pieces are essentially a quartzose ore containing 2% or 3% iron sulphide. The ore may or may not carry gold and silver. This ore is very evidently the result of alteration and silicification of an eruptive rock, possibly diorite; but this is difficult to determine, as there are no characteristic minerals present. The dark-colored rock is also impregnated with iron sulphide. It is a very siliceous rock and resembles flint, but is made up of innumerable rounded grains of chalcadonic quartz in a finer groundmass, and it may be a devitrified, glassy lava, like pearlstone. Felsite sometimes presents this appearance. Both of these rocks should be assayed for precious metals.

The rock samples from Pinos Altos, N. M., are: No. 1, typical rhyolite, in which may be seen quartz, plagioclase, biotite and other distinct crystals. No. 2 is andesite. No. 3 is a sheared and much altered rock—apparently originally granitic. No. 4 is a metamorphic rock—sericite schist.

There has been received, addressed to this department, a red pasteboard box containing three sam-

ples—one is nearly black, one gray and one yellowish green. Address of sender and locality from which rock came unknown. If the sender recognizes these samples, please send in name and address.

The rock specimen from Dyer, Nev., is hematite, of the variety known as specular iron ore; the white crystals in it are feldspar.

The rock specimen from Princeton, B. C., is a feldspathic dike rock in which there has been a large development of garnets.

The rocks from Douglas, Alaska, are: No. 1, coarse-grained calcite. No. 2, fine-grained calcite (marble). No. 3, quartz, with needles of rutile accompanying and penetrating the quartz.

The rock from Randsburg, Cal., is from a granitic dike and is rather coarse aplite, consisting of quartz and feldspar, with no mica. The small, dark spots are molybdenite, the sulphide of molybdenum. This latter mineral, although valuable, occurs in too small amount in this rock to make its treatment profitable.

The rocks from Ingot, Shasta county, Cal., are: No. 1, silicified diabase. No. 2, diabase-porphyrite.

The rock from Ballarat, Cal., is anhydrite, a variety of calcium sulphate; composition, sulphur trioxide 58.8, lime 41.2.

The minerals Nos. 1 and 2 from Dillon, Mont., are: Wad, an impure, earthy, black oxide of manganese.

## Boiler Waters and Their Treatment.\*

Written by W. M. BOOTH.

During the fall of 1902 my attention was first called to boiler compounds. A white powder was submitted for analysis, which was found to contain soda ash with a little free tannic acid. It was said that this was used to soften and to remove scale from boilers. One concern with which I was connected later had a great deal of difficulty with scale in a battery of water tube boilers, as the total solids in the water they were using amounted to 35 grains per gallon, and the scale-forming solids to more than half this amount, consisting of a large quantity of sulphate of calcium. I examined the tubes and found a very compact scale about  $\frac{1}{16}$  of an inch thick, which it was impossible to remove by mechanical means. Kerosene was tried and found ineffective. A boiler compound company offered to remove this scale, but when granted every privilege was unable to do so. Indeed, many tubes were burned out while the compound was being used. This liquid was brought to me for analysis. It was black in color, dense, had an odor of caustic soda and was very alkaline. Analysis showed this to contain, mainly caustic soda in excess, logwood, tannin, sugar, sulphate of soda, and a small quantity of gum. It is needless to say that its use was prohibited. The third compound examined contained catechu, caustic soda and tan liquor. They were, of course, 75% or higher water. The examination of a number of samples since shows that three basic chemicals are known, even by unscientific men, to attack scale within the boiler itself. These are caustic soda, soda ash, and tannic acid compounds, from sumach, catechu and the exhausted bark liquor from tanneries. A great difference of opinion seems to exist in regard to correct material to use within the boiler for the purpose under discussion. One engineer of twenty years experience tells me he has used potato water with good results; another, a little molasses occasionally, while others are partial to kerosene. That the United States patent office is willing to grant special concessions for "various and sundry" improvements in relation to boiler scale removing materials can be seen from the following, letters being substituted for the patent numbers:

A.		Parts.
Glaubers salt	.....	85
Soda ash	.....	100
Calcium sulphate	.....	10
Slippery elm	.....	4
One pound to 75 H. P.		
B.		Parts.
Ground coffee	.....	40
Logwood	.....	2
Blood meal	.....	1
Salt	.....	3
Well mixed		
C.		
Catechu, soda ash, German salts, (potash, including calcium sulphate, hydrogen sodium carbonate and common salt.)		
D.		
Wool fiber.		
E.		
Digest leguminous plants with caustic alkali, strain, concentrate and add dry moss or peat.		
F.		
Saw palmetto containing roots.		
G.		Parts.
Catechu	.....	25
Molasses	.....	56
H.		Parts.
Hemlock extract	.....	270
Soda ash	.....	150
Water	.....	130
I.		Parts.
Water	.....	450
Chest oak bark	.....	
Black oak bark	.....	
Red oak bark	.....	
Burnt sugar	.....	50
Alcohol	.....	25
J.		
Powdered coal dust.		

\* The Chemical Engineer.

Remedies from the Scientific American Encyclopedia, "Incrustation of Boilers," that have been adopted with more or less success for boiler incrustation:

1. Potatoes,  $\frac{1}{50}$  weight of water, prevent adherence of scale.
2. Twelve parts salt, 2 $\frac{1}{2}$  caustic soda,  $\frac{1}{2}$  extract of oak bark,  $\frac{1}{2}$  of potash.
3. Pieces of oak wood suspended in boiler and renewed monthly, prevent deposit.
4. Two ounces muriate of ammonia in boiler twice a week prevents incrustation and decomposes scale.
5. Coating of 3 parts black lead, 18 tallow, applied hot to the inside of a boiler every few weeks, prevents scale.
6. Thirteen pounds molasses fed occasionally into an 8 H. P. boiler prevented incrustation for six months.
7. Mahogany or oak sawdust in limited quantities. The tannic acid attacks the iron and should therefore be used with caution.
8. Slippery elm bark has been used with some success.
9. Carbonate of soda.
10. Chloride of tin.
11. Spent tanners' bark.
12. Frequent blowing off.
13. Paraffin oil has been used with excellent results in locomotive boilers.
14. Marine boilers are sometimes protected from corrosion by a very thin wash of Portland cement inside.

ANTI INCRUSTATORS.—M. E. Asselin of Paris recommends the use of glycerine to prevent incrustation in steam boilers. It increases the solubility of combinations of lime, and especially of the sulphate. It forms with these combinations soluble compounds. When the quantity of lime becomes so great that it can no longer be dissolved, nor from soluble combinations, it is deposited in a gelatinous substance, which never adheres to the surface of the iron plates. The gelatinous substances thus formed are not carried with the steam into the cylinder of the engine. M. Asselin advises the employment of 1 pound of glycerine for every 300 or 400 pounds of coal burnt.

1. BOILER INCRUSTATION, TO PREVENT.—For a 5 H. P. boiler, fed with water, which contains calcic sulphate, take: Catechu, 2 pounds; dextrine, 1 pound; crystallized soda, 2 pounds; potash,  $\frac{1}{2}$  pound; cane sugar,  $\frac{1}{2}$  pound; alum,  $\frac{1}{2}$  pound; gum arabic,  $\frac{1}{2}$  pound.

2. For a boiler of the same size, fed with water which contains lime: Turmeric, 2 pounds; dextrine, 1 pound; sodium bicarbonate, 2 pounds; potash,  $\frac{1}{2}$  pound; alum,  $\frac{1}{2}$  pound; molasses,  $\frac{1}{2}$  pound.

3. For a boiler of the same size, fed with water which contains iron: Gamboge, 2 pounds; soda, 2 pounds; dextrine, 1 pound; potash,  $\frac{1}{2}$  pound; sugar,  $\frac{1}{2}$  pound; alum,  $\frac{1}{2}$  pound; gum arabic,  $\frac{1}{2}$  pound.

4. For a boiler of the same size, fed with sea water: Catechu, 2 pounds; Glauber's salt, 2 pounds; dextrine, 2 pounds; alum,  $\frac{1}{2}$  pound; gum arabic,  $\frac{1}{2}$  pound.

When these preparations are used add 1 quart of water, and in ordinary cases charge the boiler every month, but if the incrustation is very bad, charge every two weeks.

5. BOILER INCRUSTATIONS, TO PREVENT.—For boilers of 100 H. P. fed with river water, use the following, which should be renewed whenever the boiler is emptied: Crystallized soda, 18 pounds; dextrine, 18 pounds; alum, 6 pounds; sugar, 6 pounds; potash, 3 pounds.

6. For the same sized boiler, fed with sea water: Soda, 24 pounds; dextrine, 24 pounds; sugar, 12 pounds; alum, 3 pounds; potash 3 pounds.

I have no hesitancy in saying that caustic soda in large excess is injurious to boiler fittings, gaskets, valves, etc. That it is injurious in reasonable excess to the boiler tubes themselves, I have yet to prove. Foaming and priming may be caused through excess of caustic soda or soda ash, as is well known by every practical engineer. I can strenuously condemn tannic acid, and of the use of its salts, I am fearful. It may unite with the organic matter present in the form of albuminoids and with the calcium and magnesium carbonates present. That it removes scale is an assured fact, that it removes iron with the scale is also assured, as tannic acid corrodes an iron surface rapidly. Compounds of vegetable origin are widely advertised, but often contain dextrine and gum, both of which are dangerous, as they coat the tubes with a compact scale, not permitting the water to reach the iron. Molasses is acid and has no place in the boiler, and starch substances generally should be denied. I have not investigated the action of kerosene, but know that in large quantity its use must be very dangerous, as it is a very volatile oil and must soon leave the boiler and pass over and through the engine.

We now have two materials the use of which in boilers is not prohibited through action upon the metal itself or on account of price. I refer to soda ash and caustic soda. Sodium triphosphate and sodium fluoride have both been used with success, but the cost is several hundred per cent greater than soda ash. If prescribed as per analysis, in slight excess, there should be no injurious results through the use of caustic soda and soda ash. Would it not be practicable to manufacture an intimate mixture of



caustic soda and carbonate of soda, containing enough of each to soften the average water of a given vicinity?

The less scientific members of the boiler compound guild carefully consign each sample of water to the sewer and send the regular goods. Others have a stock analysis which is sent to customers of a given locality whether it contains iron, lime or magnesium sulphates or carbonates. All money, paid in excess of 3 cents per 1000 gallons, for softening water is for the privilege of using ready-made softener. Every engineer and superintendent in charge of a plant should insist that the compound used be pronounced by competent authority free from injurious materials and that it be adapted to the water in use.

Boiler compounds then should contain only such ingredients as will neutralize the scale-forming salts present. They should be used by prescription only, so many gallons per 1000 gallons of feed water. A properly proportioned mixture of soda should answer the demands of all plants depending upon this method of softening water in limestone and shale regions. It is to be remembered that a number of chemical salts, some of which suffer decomposition at the temperature and pressure of the boiler, are always found within the boiler itself, if the feed water is softened by boiler compounds. What occurs chemically, under such conditions, is a question, and salts of magnesium probably suffer considerable decomposition.

However, for small isolated plants, requiring the softening of water, boiler compounds can hardly be replaced on account of the simplicity of their action and use. Their cost should not be prohibitive, and they should render efficient service in connection with the particular style of the boiler. Steam mills, factories and small power plants, generally, often cared for by incompetent and careless engineers, require some material easily applied. For plants of from 75 to 150 H. P. 24-hour settling tanks will answer the purpose of a softening system. Two tanks, each capable of holding a day's supply and furnished above with lime and soda tanks in common, and provided with sludge valves below, may be used for this purpose. Paddles in each tank capable of thoroughly stirring the contents may be actuated from above. Large plants are operated on this principle, serving boilers of many thousand horse power. Such a system has an advantage over a continuous system, in that the exact amount of chemical solutions, required for softening the particular water in the tank, can be applied. For some variations of such a system, several companies have secured patents and are doing a large business. The fundamental principles themselves are not patentable, and have been used for many years.

For a plant with a boiler capacity of 500 H. P., a water softening system is capable of saving a great deal of money. The present tendency in connection with manufacturing concerns is to group in one battery boilers aggregating thousands of horse power. They are more easily cared for, more easily handled and render more efficient service than many isolated units. For such plants, boiler compounds and settling tanks are replaced to advantage by water-softening systems, capable of treating several thousand gallons of feed water per hour. The lime soda ash treatment has been found to be very efficient for ordinary waters. The soda ash is usually added in slight excess. It is very necessary to the engineer of such a plant to have at his right hand the services of an experienced chemist, to whom, periodically, the water should be submitted both before and after purification.

We have thus outlined the method of treatment possible of being followed by plants in most sections of the Middle States, where waters used for boiler purposes are usually hard, containing lime and magnesia, the shale sections also adding a large amount of sulphate of calcium to the water. The treatment of sea water is a special case and is beyond the scope of this paper. Waters on the Eastern coast are ordinarily very soft, as they are taken directly from rivers. In New England much of the superficial rock is of a granitic character, which produces scarcely any scale. The water of the West contains a large excess of alkali, more particularly the Southwest, and the problem of making this applicable to boiler use is as yet but partly solved. The very substances that are found in the Eastern waters at the conclusion of the softening process, that is, sulphates of soda and magnesium, are found in very large quantities; in natural waters sometimes 30 to 40 grains per gallon, and above, in the West and on the lines of the Southwestern railways. Lime is sometimes added to these waters to produce a slight scale and to prevent foaming. In the Northwest and Middle West, much of the water is highly charged with organic matter, which requires a coagulant, and several firms have been successful in removing this form of incrustation with alum compounds, principally aluminum sulphate. But our problem is particularly in connection with the waters of the Alleghany Mountain system, and I am frank to say that I consider its solution yet considerably beyond our grasp. Would it not be a profitable source of revenue to originate and maintain companies, the object of which would be to furnish softened water to the manufacturing districts of our large cities? This water could be obtained from artesian wells.

The following experiment was tried to ascertain

the action of various compounds, used for water softening, on steel.

On the first day of January I weighed into each of several tubes one gram of soft open-hearth steel of the following analysis:

	Per Cent.
Carbon .....	0.15
Phosphorus.....	0.06
Manganese.....	0.40

I was very particular to use uniform drillings and rinsed each tube several times with distilled water and finally with the liquid to be tested. To the borings in the tubes were added 15 c.c. each of the following solutions:

1. Distilled water.
2. Syracuse water, an equal amount.
3. Cortland water.
4. A solution of tannic acid.
5. A slightly alkaline solution of sodium tannate of about deci-normal strength.
6. Distilled water and mono-hydrate crystals.



Regrinding Room of the Cananea Consolidated Copper Co., Cananea, Mexico.

7. Deci-normal caustic soda.
8. Syracuse water containing lubricating oil of the following composition: 10% vegetable oleins, 90% hydrocarbons. These tubes were placed in a beaker with a piece of paper secured over the top with a rubber band, then placed upon a radiator, where they were left at a temperature of 21° C. for ten days. Upon examination the appearance of the material in each test tube was as follows:
1. Metal very badly corroded.
2. Syracuse water, an equal amount, permanently hard.
3. Cortland water, temporarily hard.
4. So badly corroded in color that filings could hardly be seen in the solution.
5. Of about the same degree of corrosion as the previous one.
6. Clear, scarcely acted upon.
7. Deci-normal NaOH, a white flocculent precipitate.
8. Medium corrosion.

These tubes were allowed to remain either on or near the radiator until February 8. The borings from the tube containing mono-hydrate crystals were removed, shaken several times in anhydrous ether, dried and weighed. The weight was found to be 1.0014 gram with a gain of 0.14%. The borings in the tube containing caustic soda were examined in a similar manner, dried and weighed. They were found to weigh 0.99965 gram, that is a loss of 0.035%. In both cases the steel had not been changed in appearance, or appreciably in weight during more than one month while in contact with the alkaline solutions, while in every other case the liquid had so corroded the drillings that the solution had become opaque.

(TO BE CONTINUED.)

PLACERS may be located in any form on the unsurveyed and unoccupied lands of the United States, but where the lands have been surveyed by the Government it is required by the statutes that placer locations shall conform to the public land surveys as closely as possible, and to

facilitate this idea the Government permits the locator to take his claim up in contiguous 10-acre tracts. This will not permit taking a claim 600x1500 feet, which is the usual size of a quartz location, but the claim may be taken 660x1320 feet, which is exactly the size of two adjoining 10-acre tracts. A square tract containing ten acres measures 660 feet on each side. So if the principal survey lines are known, that is, the section or quarter section lines, the locator may stake his placer claim with reference to these lines. In so doing great care should be given the description as referred to the land survey.

### Bryan Roller Mills in Mexico.

The accompanying interesting illustration shows one-half of the regrinding room of the concentration department of the Cananea Consolidated Copper Co. at Cananea, Mexico. In this department are eight

Bryan roller mills, all of which are doing satisfactory work. The object of employing these mills at Cananea is to recrusher certain products of concentration for the purpose of freeing the finely disseminated grains of copper sulphide which would otherwise be lost.

### The Rational Design of Head Frames for Mines.

TO THE EDITOR:—I notice in the issue of the MINING AND SCIENTIFIC PRESS of June 10, 1905, an interesting contribution on the design of head frames, by Mr. Geo. S. Binckley, and his remarks about the defective use of steel in many of these structures are undoubtedly well taken. His conclusions as to the most rational design of head frames, on the ground of economy of construction, are likewise quite correct, but similar designs have long been past the stage of mere suggestions; a number of frames built on these lines have been in operation in Europe—namely, in Germany—for many years, and I would refer you to an article by Mr. John Ross, Jr., on the equipment of the Wildman-Mahoney mines at Sutter Creek, which appeared in your paper on November 18, 1899, with cuts of a head frame designed by the writer for that company, precisely on the principle suggested by last Saturday's article. This does not by any means detract from the correctness of Mr. Binckley's remarks on the subject, and is merely mentioned as a matter of record.

A. E. CHODZKO.

THE Secretary of the Interior has made a decision concerning the school lands of Montana which will be of great value to the educational interests of that State, in declaring that the lands claimed by the State as school lands, although in the mining regions, and probably more valuable for mineral than for other purposes, may nevertheless be held by the schools unless they were actually claimed and located as mineral land by others prior to Nov. 8, 1889.

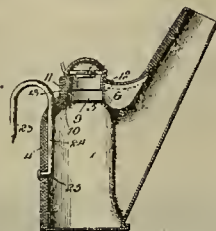


# Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 6, 1905.

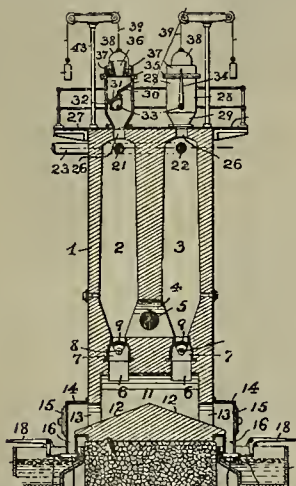
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

MINER'S LAMP.—No. 791,276; E. F. Long, Scranton, Pa.



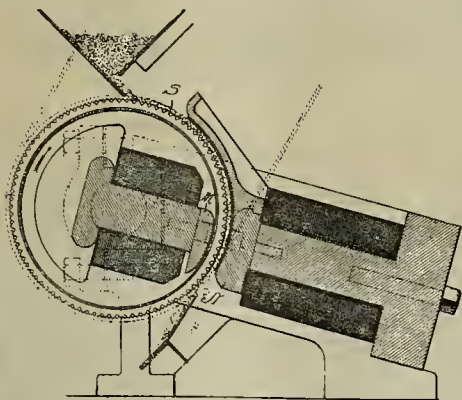
Device of class described, comprising body having neck, collar fitted on neck of body, pintle rod having attachment portion interposed between neck and collar and clamped to former by latter, and lid hinged to body by pintle rod.

REDUCTION FURNACE.—No. 791,660; G. Walzel, Newark, N. J.



Limestone reducing furnace, comprising single stack and multiplicity of internally disposed shafts, means of communication between lower portions of shafts, single gas conveying means connected with means of communication between the shafts, charging device arranged upon top of each shaft, an independent outlet at bottom of each shaft, and emptying device connected with outlet of each shaft.

APPARATUS FOR MAGNETIC SEPARATION.—No. 791,494; C. Q. Payne, Stamford, Conn.

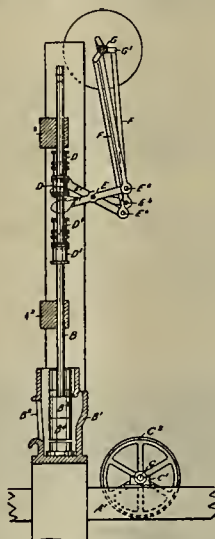


In magnetic separator, combination of transversely laminated separating cylinder provided with plurality of magnetizable laminae having toothed edges relatively so placed that teeth of laminae project circumferentially beyond those of adjacent laminae; means for magnetizing cylinder and for maintaining material undergoing separation in close proximity to cylinder along considerable segment thereof below its horizontal diameter and within magnetic field.

PROCESS OF EXTRACTING NICKEL FROM NICKEL-BEARING SUBSTANCES.—No. 791,090; H. A. Frasch, New York, N. Y.

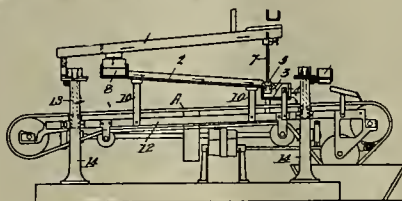
Process of extracting nickel from matte containing same, consisting of pulverizing matte and exposing it to action of sulphuric acid and flowers of sulphur, and subjecting mixture to action of heat.

APPARATUS FOR OPERATING STAMP MILL DRIVES.—No. 791,732; R. Taylor, Subiaco, Western Australia, Australia.



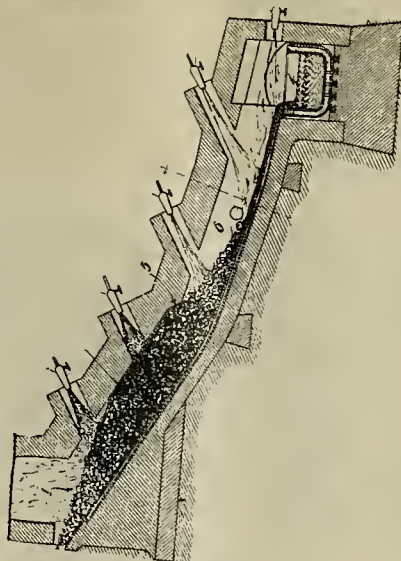
Apparatus for operating stamp batteries, drop hammers and the like, combination of lever fulcrumed upon fixed pivot and having one end formed as double-faced cam, each of faces being described upon cylindrical curve, stamp or hammer shank to one side of which cam end of lever passes, upper tappet upon shank with which upper cam face engages, to lift shank and concurrently turn it, lower tappet at appreciable distance from upper, out of engagement with cam, against which lower cam face may strike blow when lever is rapidly driven, means for vibrating lever, and renewable linings for tappets.

CONCENTRATOR ATTACHMENT.—No. 791,711; F. S. Morgan, Nevada City, Cal.



Combination with endless traveling concentrator belt and oscillating frame thereof, of standards fixed to and rising above frame, amalgamated plate supported upon standards and inclined downwardly toward head end of belt, sluice leading from feeder and inclined toward higher end of plate, sluice being fixed relative to plate and frame, distributing box at higher end of plate and into which sluice discharges, distributor box at lower end of plate into which plate delivers, narrow trough fixed in second-named box adapted to separate free gold and amalgam and deliver lighter pulp and sulphurets over its edge into box, and fixed pendent support having points positioned in trough to agitate contents during oscillations of frame and plate.

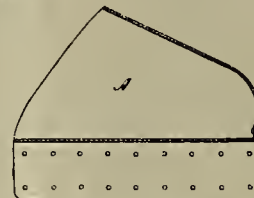
PROCESS OF SMELTING ORE.—No. 791,577; E. Rivoll, Los Angeles, Cal.



Process of smelting metalliferous rock, which consists of establishing zone in suitable furnace in which flames of imperfect combustion are projected from burner supplied with fluid fuel, and establishing another zone in which flames of perfect combustion are projected which produce smelting heat, and moving ore through zones whereby in first zone car-

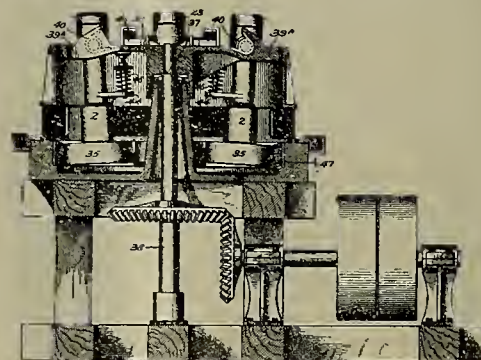
bon is deposited on ore and whereby in second zone ore is smelted and gases arising in second zone are passed through ore in first zone whereby ore is deoxidized in first zone before it passes to smelting zone.

DREDGER BUCKET.—No. 791,700; J. J. King, San Francisco, Cal.



Dredging bucket having segmental shell open at front, convergent toward rear and bent to form integral tail piece and closure at rear end, plate flanged and riveted to form closure for open sides of shell, plate having upwardly turned flange riveted to coincident edge of tail piece and side flanges bent downwardly and forming frog.

ROLLER-BEARING MULLER FOR HUNTINGTON MILLS.—No. 791,680; H. Eggers, Denver, Colo.

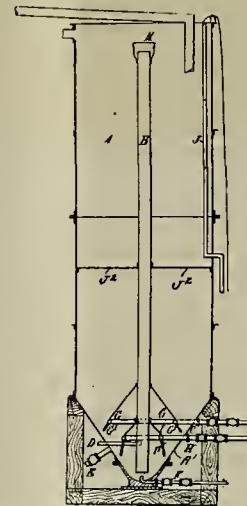


In muller for Huntington mills, combination with driving shaft having bracket secured upon upper end, of vertically disposed sleeve having trunnions near upper end, which are supported by bracket, shaft in sleeve which depends from bearings in upper end thereof, and extends beyond lower end thereof; tapered roller head on lower end of shaft; wooden packing ring of like taper on roller head, and tapered steel ring on packing ring; bracket extending from side of sleeve, vertically disposed coiled spring interposed between bracket and bracket on top of driving shaft, and means for varying tension of spring.

ORE BRIQUET.—No. 791,799; W. A. Koneman, Chicago, Ill.

Ore briquets for blast furnace treatment, composed of properly proportioned ore fines, finely divided uncoked bituminous coal and finely divided anthracite coal intimately mixed together, and binding agent mechanically uniting mixed particles of ore and coking and non-coking carbons and holding ore fines and non-coking particles until fines and particles are held by particles coked in initial combustion in blast furnace.

APPARATUS FOR CIRCULATING AND MIXING CRUSHED ORE.—No. 791,872; F. C. Brown, Komata, New Zealand.



Apparatus of character described, comprising tank adapted to receive material to be treated, centrally arranged material-conducting pipe suspended therein and terminating at point removed from bottom thereof, means arranged in operative relation with respect to pipe and adapted to supply medium for forcing material up through and out of pipe and into tank, and fluid supply pipe opening into conducting pipe.



## Discovery and Development of the Homestake Mines of South Dakota.

Written for the MINING AND SCIENTIFIC PRESS.

Gold was known to exist in the Black Hills of Dakota as early, at least, as 1868, and this fact is mentioned in one of the early Hayden reports. That gold was to be found in the Hills was probably known to the traders who came in contact with the Sioux, long before the date mentioned, is almost certain. It was said by the Indians that Father De Smet, a Jesuit priest, who made his home among them, cautioned them against showing the gold to white men, or even mentioning its presence. In 1874 a halfbreed Indian took some placer gold in quills to an Indian agency and described the locality in which he found it as being in the eastern foothills of the Black Hills. In 1875 began the movement of prospectors into the

efforts met with small reward, but in searching for a straying horse the party came into Deadwood gulch, at the mouth of what was afterwards called Slaughter House gulch, about half way between Deadwood and Central City. Camping on a bar at the side of the canyon, some of the men commenced at once the work of prospecting, while others attended to the duties of the camp. In a short time the discovery of a "color" was announced—a little nugget of gold worth about 50 cents, together with some fine specks of gold. Other colors were found by the prospectors and the indications were that the party had found pay gravel. This claim, known as the Wheeler Boys' mine, produced over \$100,000 during the summer of 1876, and was worked and reworked by others for two or three years thereafter.

The news of the strike on Deadwood gulch—so named because of the large amount of dead pine timber over the surrounding hills—spread quickly and in a few weeks there were hundreds of men working along the stream, and this number was soon there-

In the upper part of the gulch the canyon opened out somewhat. The hills, though not less high, were not so steep, and here a townsite was laid out and called Washington. Shortly after this a second townsite was located, adjoining Washington, which was called Golden.

Naturally, some of the more thoughtful prospectors began to search for the source of all the placer gold being taken from the surrounding gulches, and their quest led to the discovery of the Homestake mine by the Manuel brothers in 1876. The discovery was made on the north side of Gold Run, some distance from the stream, and amid brush and fallen timber. Wherever the rock was exposed it showed a dull red color. Every piece of rock taken from the surface, when crushed, gave a prospect of gold in the pan. Other claims were staked in the vicinity, among them the Highland, Palmetto, American Flag, Clara, Homestake No. 2, Big Missouri, Giant and Old Abe. All of these claims have since become famous.

In Deadwood gulch active prospecting had been



A Portion of Lead, S. D., Showing Homestake Mine.

Hills, which, after the discovery of Deadwood gulch, was swelled in 1876 to a stampede of tremendous proportions. It is stated that no less than 40,000 people of both sexes, of all ages, nationalities and conditions in life, rushed to the newest gold field. The first gold discovered by the white men of this rush was in Custer county, on French creek. Gold was found, it is true, but not in large amount. The prospectors scattered throughout the Hills. Every gulch, canyon and ravine was visited and thousands of pits were sunk in the southern Hills. Some gulches were prospected and declared worthless by the first comers, which afterward were worked with success by those coming later, and who were more thorough in their work. All the men going into the Hills at this time were not "tenderfeet." Many were from older mining camps. Colorado, Nevada and Utah furnished large delegations, and Montana particularly was well represented. One party in particular, known as the Gordon party, composed chiefly of Montana men, dissatisfied with the meager prospects on French and Spring creeks and in the numerous dry gulches, pushed northward through a wilderness of hills and canyons, in a hostile Indian country, searching for better pay. For a week or more their

after swelled to thousands. The prospectors pushed out into the neighboring gulches in every direction. Gold was found in nearly every gulch in the vicinity. Whitewood creek joins Deadwood in what is now the city of Deadwood, and the Whitewood was found payable for about 3 miles above town. There entered from the south a narrow canyon called Gold Run. This gulch was one of the richest ever found in the Black Hills. Several hundred thousand dollars were washed from it, though only a little over a mile in length. Gold Run was discovered in February, 1876. The news of the rich discoveries on Deadwood, Gold Run, Bobtail and Blacktail gulches reached Custer City—a town of 1400 houses and over 8000 people—in March following. In less than a month the entire population left Custer for the north, leaving but a score of people in the first metropolis the Hills ever knew.

Upon the discovery of a payable placer field the first thing to be done, after staking claims, is to establish a town. In this instance Deadwood became the principal city. In Gold Run the lower end of the canyon was too narrow and the sidehills too steep to admit the laying out of a town. Fallen timber obstructed travel for everything except pedestrians.

going on and lode claims were located by the score. Among these were some mines which later became noted. The Father De Smet was the most prominent. In Bobtail gulch the Deadwood mine and Golden Terra were quickly recognized as belonging to the Homestake system, lying between the De Smet group on the north and the Homestake group on the south. The Caledonia, in a tributary of Bobtail gulch, also soon came into prominence. It is a curious fact that all of these mines, which in this remarkable district have been worked with large profit, were early recognized as mines possessing great merit. There have been no surprises in this regard—that is to say, no mine of this vicinity which in the early days was considered of little value has since proved to be a bonanza. In Blacktail gulch rich conglomerate mines were located and worked. The Alpha conglomerate mine, on the divide between Deadwood gulch and Bobtail, was the first mine in the Hills to be equipped with a mill.

In those early days, although the prospects of the mines of this belt were persistent enough, and gold could be obtained without trouble from almost any piece of rock one tested, the grade of the ore was so low that few who gave the matter serious attention



believed the mines could be operated profitably for many years to come—"too low grade" was the verdict of miners generally, and also of some who were recognized as expert and with large experience. There is little wonder at this when the conditions were considered. The district was in the heart of a hostile Indian country; it was about 300 miles to the railroad at Sydney, Neb., or Cheyenne, Wyo.; labor and supplies were high, and the deposits were, at that time, an anomaly. They did not appear to be veins, and many did not hesitate to express the opinion that they would not go down. The walls were often poorly defined and uncertain, slate was as likely to be as good ore as quartz, and the experience of the past seemed to count for nothing. Notwithstanding all of these drawbacks, the work of development on the numerous claims proceeded as rapidly as the means at hand and conditions would admit, and in the summer of 1876 several transfers of lode claims were made. Mining methods were crude in the extreme. Each claim was worked independently, there was no system of development, nor of anything else.

The rich streaks were followed and the mines worked by tributaries, with little regard to future consequences. Small quartz mills were brought in and set up, some to work the conglomerate deposits on Deadwood and Blacktail gulches, others to crush the quartz from the lode claims. There were a dozen mills in Central City, mostly crushing "cement" rock, in the latter part of 1877, and half as many in Poorman gulch and Lead City, as the towns of Washington and Golden were now called—and these latter mills were working on both "cement" rock and quartz from the lodes. The first mill on the Homestake was a 35-stamp custom mill. This mill was in marked contrast to the great mills since built by the Homestake Co., and nothing, perhaps, shows more effectually the evolution in methods than a comparison between this mill and a modern Homestake mill.

This mill was equipped with thirty-five stamps, each weighing about 700 pounds, and amalgamating was done on short raw copper plates. The ore was delivered at the back of the mill by wagons holding about four tons of quartz each. It was dumped onto a platform of planks and shoveled over a partition about 5 feet high onto the feeder floor of the mill. There were no automatic feeders in those days, and all the pieces of ore too large to pass through the feed slot, at the back of the mortar, had to be broken up with hammers. The feeding was done with shovels, one man attending to ten stamps each shift of twelve hours. If he got behind with his work for a time he was given assistance, but usually some of the stamps were hung up for brief periods, while waiting for ore, which was not always assured by wagon delivery. There were no concentrators in this mill, nor in any other of the early mills built in the Hills. This mill was a fair sample of the mills at first built in the Black Hills, though few of them had more than twenty stamps and some but ten. The first large mill was the Homestake, and contained eighty stamps of 900 pounds each. This mill was built in the summer of 1878, and was shipped from San Francisco, Cal., at a cost of 6 cents per pound for freight, as all the heavy machinery was hauled from Cheyenne, Wyo., by bull teams. The mill cost \$140,000. It has since been enlarged to 200 stamps.

In these early days, as previously stated, the leasing system was introduced and the leasers had their ore hauled to custom mills for crushing. As a natural result, where these large ore bodies of low-grade rock with streaks of better pay were found, the leaser naturally followed the best pay, unless restricted by the terms of his contract. The mines were soon honey-combed by a network of irregular holes, made without system, or object, other than to get out rich ore as quickly as possible. Drifts were run into the hillside on the veins and underground stopes opened up. In some instances open cuts were made and large amounts of ore mined in this way. As a result of these slipshod and unmethodical methods, disastrous caves occurred. The California company, as the Homestake company was at first called, introduced the Nevada square-set method of timbering and this for a time lessened the dangers and losses due to caving ground. This system, however, has its limitations, and stopes can only be excavated with safety by stoping in sections, and filling the excavation contemporaneously with waste, or by stoping the ore, and drawing off only such amount as will afford the miners working room.

In the summer of 1878 the Homestake company commenced to work the Homestake mine by open cut system. A long drift had been driven into the hill and a raise put up to the surface. This raise was enlarged at the top and the cut grew rapidly in size, and later stopes were opened underground from two shafts sunk near the hanging wall of the main Homestake vein. These levels were connected with the surface by means of raises, and chutes were built on the levels below, and stoping by means of surface work became an important feature of mining on this great lode. In the spring of 1879 the first 120-stamp mill was built, to be followed soon after by a second mill of the same size. The Homestake company began to increase its holdings of mining property by the purchase of surrounding claims.

Mining operations were conducted on an increasingly larger scale. The great mills—at that time

the largest in the world—were beginning to make a record for production, and the Homestake, as everything on the north side of Gold Run was commonly called, began to be spoken of as one of the greatest mines in the world.

Water was required in ever increasing quantity to keep pace with the repeated expansions of mining operations, and water was developed in streams miles away from the mines and conducted by pipes, flumes and ditches to Lead City. Still all the water available was insufficient, and settling reservoirs were constructed in Gold Run, and the clear water pumped back for reuse. The large and constantly increasing demand for timber and cordwood resulted in the construction of a narrow-gauge railway, which eventually was over 60 miles in length, including its numerous branches and spurs. This road was built into the timber belt south of Lead City. The surrounding hills for miles have been denuded of the accessible timber. During summer the railroad hauled timber and cordwood for the entire year. Cordwood accumulated at the various hoists and mills, in vast quantity. Between the Homestake 80-stamp mill and the 120-stamp mill it was customary to pile up 8000 cords of 4-foot pine wood for winter's supply. It was delivered at the head of a chute, down which the sticks slid, piling up in a great mound nearly as large as the big mill itself. The railroad also delivered wood to adjoining properties at Terraville.

In the timber sheds gang saws cut the timbers and framers quickly prepared them for the square-set system which had been extensively adopted in all of the big mines. These timbers were seldom less than 12 inches square and from that up to 24 inches. The timbering was done by expert Comstockers, or by men who had learned the business from them. These stopes were often 100 to 150 feet long, 100 feet wide and carried up usually eight to ten floors each 8 feet high. Not only was this the practice in the Homestake mines, but in the Highland, Golden Terra, Deadwood, Father De Smet and Caledonia. Old timers on the Homestake belt will remember with distinctness the caves in the Highland, De Smet, Golden Terra and Caledonia. These caves were due in each case to the stoping of too large areas while depending wholly on the timbers for support. Here, as elsewhere, this support proved insufficient, but the caves never occurred without warning. For days and sometimes for months the settling of the ground, the splintering and shifting of the timbers, the crushing of joints, and the fall underground of small rocks gave abundant warning of the approaching collapse. And yet there was at hand an inexpensive and safe remedy for this condition.

The ore bodies of this district occur in pre-Cambrian schists, which have been intruded by large dikes of felsite. The schists are overlaid by the quartzites, sandstones and limestones of the Cambrian, with conglomerate at the base, and where not eroded, by later formations. The intrusive dike rock had penetrated into the overlying sedimentary beds, lifting them in a dome-shaped mass, and thrusting sheets of felsite between the strata of these Cambrian rocks, forming a typical laccolith. In the vicinity of Lead City these sheets of intrusive rock were from 5 to 10 feet, and in places 200 feet or more in thickness. In some instances the sheet lay directly on the ore, in others the conglomerates rested on the schists.

Above the Homestake vein and on the hanging wall side was one of the largest of these masses of intrusive rock, although the vein itself was uncovered by erosion. At the Highland a sheet of felsite covered the vein and so also did it at the Deadwood. At the latter mine thousands of tons of this "porphyry," as it was called, were stripped from the vein, in order that the ore might be safely removed. At the Highland the ore was stoped up nearly to the felsite when the mass caved and destroyed a stope. At all of these mines this waste, which became such an annoyance and source of expense, could have been utilized to good advantage in filling the underground stopes, but mining science had not, at that time, progressed to that point in the Black Hills, although this is the common practice to-day.

At the Caledonia a crosscut tunnel was run into the hill 800 feet to the ore body. The usual open cut at the surface was made, connecting with a stope above the tunnel level. The tunnel reached the vein 200 feet from the surface—the dip of the schists of this region is from 45° to 65°, and sometimes steeper. A shaft was sunk at the end of the Caledonia tunnel, in about the middle of the vein. This shaft reached the foot wall of the main or hanging wall vein, about 100 feet below the tunnel level. A large stope was opened on this level, called the 300. Around the shaft was left a pillar of ore about 30 feet square. The vein measured horizontally was here 195 feet wide. The stope was heavily timbered, but the weight of the superincumbent ore, resting on a talcose foot wall, resulted in collapse and the hoisting machinery went down with the cave. This accident, which might have been avoided by running in porphyry filling from the surface, cost the Caledonia company many thousands of dollars and for a time completely suspended all operations, except those of recovery of the lost workings.

The methods of working were continued along practically the same lines for years, the process of

evolution being slow, but as time went on experiments were made and radical changes were introduced, until to-day there are no mines of the Homestake belt being worked by the same systems as those followed for the first ten years of mining in the Black Hills.

All of the mills after the Homestake 80, large and small, were equipped with rock breakers and raw copper plates. Concentrators were tried at one time in one of the Homestake mills, but, proving unsatisfactory, their use was discontinued, and instead, what were known as "blanket houses" were built. There were two of these on Gold Run below the mills. They were provided with a series of shallow sluices each about 22 inches in width. In these sluices were laid long strips of Brussels carpet, over which the tailings were run. These carpet sluices caught a large amount of concentrates, consisting chiefly of partly oxidized pyrite, iron from stamps and mortars, and coarse sand. The carpets were washed from time to time (three or four times daily) in tanks of water at the lower end of the buildings, which were about 300 feet in length. Several thousand tons of this low-grade material were saved in heaps outside the buildings and afterward sold to the Deadwood and Delaware smelter.

There was little specimen rock in these mines, though occasionally there were found handsome pieces of gold-bearing ore. Generally the rock ran \$4 to \$5 per ton in the upper levels, but this value decreased somewhat with depth, though the great increase in the size of the ore bodies in depth more than compensated for the falling off in value. There were through all of these mines streaks or zones of higher grade ore, but these were no longer followed, leaving the poor ore standing, as was the case under the leasing system. The rich ore was broken in proper proportion to insure as regular a monthly output as possible, and this has always been a notable feature of the Homestake—uniform output—and this company has never missed a dividend. The development work has always been kept well in advance of stoping operations, and the entire vast holdings and equipment of the property has been paid for by the mines. The original call was for \$200,000, and since that was paid in, early in 1878, the mine has been not only self sustaining, but has spent millions of dollars in betterments, and paid millions more in dividends. The production has been nearly \$80,000,000.

In time the Homestake company, the first to extensively operate on the lode, absorbed the Highland, the previously consolidated Deadwood-Terra, the De Smet, Caledonia and other mines of the group, until it now owns practically all of the territory extending from Deadwood gulch southward for 6000 feet or more with a width of 2000. All of this territory is not ore, but there are so many and such large ore bodies that the amount of ore available is estimated by the millions of tons. There are on the consolidated properties six stamp mills, having a total of 1000 heavy stamps, each of which crushes over four tons of ore daily, or about 1,500,000 tons annually. There are mines making some pretension to greatness that have not 4000 tons of pay rock in sight, and but few can show enough ore to keep this aggregation of stamps employed for a year. Below the 800 level and extending below the 1200 level it is known that the main ore shoot of the Homestake mine is from 400 to more than 500 feet wide.

The amount of ore required by these great mills demands much resourcefulness on the part of the management, and there must be ample facilities to handle the immense tonnage. There are six shafts, all well equipped, the principal one being the Ellison, which has three compartments, two of which are equipped with double-deck cages, the third being for air pipes, water column, etc. This shaft has cost \$500,000 and is equipped to go to 3000 feet.

The compressors have abundant capacity to supply 250 rock drills, and one is used to supply motive power to underground motors and to motors on the surface tramway which runs from the Ellison shaft to the mills. The cars are hauled in trains of twenty-eight steel 4-ton cars, over a steel trestle which at one place is 100 feet high. From the Old Brig shaft, ore is delivered to a mill by aerial tramway, and from the Golden Gate, the ore is sent to mill by a Robins belt conveyor.

(TO BE CONTINUED.)



**Goldfield District, Nevada.**

The most interesting mining region in the western United States to-day—that is, the one which is at present attracting the greatest amount of attention,

Geological Survey. It is the latest and most complete description of the Goldfield region thus far published:

DEVELOPMENT.—The new camp of Goldfield, in Nevada, was revisited by the writer in November of this year (1904). This district lies 23½ miles south of

February, 1904, however, rich finds began to be made in certain spots south of Columbia mountain. Now there are probably upward of 6000 inhabitants in the district. The town of Goldfield and a number of adjacent smaller camps have sprung up. It is estimated that \$2,000,000 worth of ore had been shipped up to



Columbia Mountain and Mine to the Right, Showing Strata of Porphyry and Limestone Tilted up by the Granite.



The January Gold Mine, Goldfield District, Nevada.



The Black Butte and Quartzite at Diamondfield, Goldfield District, Nevada

is that about Goldfield, in southwestern Nevada. This district was discovered in the latter part of 1903, and was at first called the Grandpa district. This was later changed to Goldfield. The following description of the geology of the district is by J. E. Spurr, and is from Bulletin 260 of the United States

Tonopah (about 28 miles by wagon road), and was located late in the spring of 1903. At the time of the writer's first visit, shortly after its location, the only work being done was by a few men on what is now known as Columbia mountain. Up to that time no good strikes had been made. About January and

November, 1904; since then the amount has been largely increased.

CONDITIONS.—Goldfield is reached by stage from Tonopah, to which point a railroad runs, connecting with the Carson & Colorado Railroad at Rhodes; a branch is now under construction to Goldfield. The



camp has a water supply which is said to be sufficient, but in all other respects—fuel, climate, supplies, etc.—it partakes of the inevitable disadvantages of the desert.

**GENERAL GEOLOGICAL SITUATION.**—The district is bounded on the west in part by a lava-capped mesa (the capping lava is reported to be basalt. A brown sandy-looking rock underneath this, a specimen of which was sent to the Survey by Mr. Maynard Bixby, is a rhyolitic glass flow), whose erosion has laid bare the underlying gold-bearing rocks. The auriferous region is characterized by numerous low, irregular ridges standing out from the lower and more nearly level surface. These ridges owe their origin to hard reefs of quartz which form their crests, whose resistance to erosion has left them thus protruding above the general elevation; and in these quartz reefs the auriferous deposits are found.

**COLUMBIA MOUNTAIN.**—Columbia mountain is the most prominent of the ridges, and some notes on its geology were made public by the writer last year in notes on the geology of the Goldfield district, Nev., Bulletin United States Geological Survey No. 225, pages 118–119. Near the south end of the ridge the rock is largely alaskite (an igneous rock consisting of quartz and feldspar), which is sometimes of granitic structure and sometimes very fine grained, even resembling quartzite. White mica or muscovite is sometimes present, and pure quartz veins or dikes of similar origin also occur. These alaskitic rocks are intrusive into a dark siliceous rock (jasperoid), which is probably the result of the silicification of an original limestone. We may believe this limestone to have been Paleozoic, and the alaskite is certainly

pah. The rhyolite resembles the rhyolite of the Gold Mountain district, which lies about 4 miles south of Tonopah, on the road between Tonopah and Goldfield, and this Gold mountain rhyolite again resembles closely some of the phases of the earlier (dacitic) rhyolite at Tonopah. The relative ages of the rocks at Goldfield have not been determined, but it may be that they are like similar rocks at Tonopah.

**PERIOD OF MINERALIZATION.**—At Goldfield the ores occur in both rhyolite and andesite, showing that the mineralization occurred subsequent to the eruption of both lavas. At Gold mountain the ores evidently were formed after the eruption of the rhyolite, and at Tonopah the eruption of the earlier (dacitic) rhyolite was followed by a period of mineralization which produced veins showing frequently a larger proportion of gold than the locally more important veins whose formation followed the eruption of the earlier andesite. There is, therefore, the possibility that the Goldfield deposits are identical in origin with the later series of veins at Tonopah. Indeed, there are at Tonopah, in one place at least, mineralized quartz reefs in rhyolite tuffs which have the same peculiar characteristics as those of the Goldfield reefs, and these Tonopah deposits have afforded moderate assays showing gold and no silver.

**NATURE AND ORIGIN OF THE ORE DEPOSITS.**—The veins at Goldfield are not persistent nor well defined. The outcrop of the quartz bodies are irregular, straggling, branching and apt to disappear suddenly (Fig. 1). Neither were any definite systems observed, though further study might detect them. The outcrops may even be nearly circular or crescentic, and frequently they are roughly lenticular and

been extracted. It is then seen to have a definite channel-like shape, often more regular than that of the whole outcropping reef, though it has usually a limited extent in the direction of its greatest elongation (Fig. 2). It seems that these pay shoots represent the main channels of hot water circulation, while the siliceous casings are the result of the water soaking through the rock adjacent.

**VALUE OF ORES.**—The ores are often of very high grade. As an extreme example may be noted a shipment of fourteen and one-half tons from the Sandstorm (Kendall claim), which, when worked in a stamp mill, yielded \$45,783 net, while the tailings still contained about \$1000 to the ton. From the McKane-Bowes lease on the Jumbo there was taken out in five months, from a space 100 feet long and 200 feet deep on the shoot, \$600,000. One small shipment from this lease—917 pounds of ore—gave gross returns of \$4766. The whole production of the camp has been from ore which may be roughly estimated as averaging \$200 to \$300 per ton or more. The values are generally all in gold; silver is usually practically absent, though the shipping ore from the Combination mine contains from one to three ounces.

**DEPOSITION OF RICH ORE DURING OXIDATION.**—The origin of this rich ore is important to consider in order to judge the future chances of the district. Most of that which has been extracted up to the present time has been oxidized ore. The ores are mixed sulphides (usually in large part pyrite) and oxides up to near the surface. The oxidized material which follows cracks and seams is usually found to be several times (sometimes several hundred times) as rich as the unoxidized portion. The irregular spongy



The Simmerone Mine, Goldfield District, Nevada.

pre-Tertiary. On the north end of the mountain the rock is a very much altered rhyolite, in which are broad masses of white to purplish and reddish cherty quartz, extending irregularly in a northern direction. This quartz is simply a highly silicified rhyolite. The silicified areas have ill-defined walls, and the highly mineralized portions which they inclose are very irregular.

**PRODUCTIVE AREA.**—The area of known ore bodies has, since last year, spread far out from Columbia mountain, so that now it may be estimated at about 6 miles square. The most productive area is inclosed in a square 2 or 2½ miles in either direction. The chief mines at the present time are the Jumbo, the Combination, the Florence and the January, all grouped together about a mile south of the southeast end of Columbia mountain. About 5 miles southeast of the Columbia mountain is the Diamondfield group, including the Vernal, the Quartzite and the Black Butte. Shipments have also been made from this group. Other ore deposits have been developed in various parts of the field.

**NATURE OF ROCKS.**—The rocks in that part of the field examined during this last trip (the region of Columbia mountain, Diamondfield, and the Jumbo group of mines) were found to be almost entirely volcanic, consisting of rhyolite, rhyolite tuffs, andesite and basalt, all probably of Tertiary age. The alaskite and jasperoid of Columbia mountain are hardly represented in the surrounding district. In a press bulletin, given out earlier, the rock constituting the ore at the Tonopah Club mine was characterized as probably jasperoid (silicified shaly limestone). The specimen collected, however, proves upon microscopic examination to be a somewhat disintegrated glassy volcanic rock. The predominant rocks are abundant rhyolites and andesites, while basalt is rare. One andesite from near the Tonopah Club, examined microscopically, is a hornblende-andesite, resembling the earlier andesite at Tonopah. A patch of basalt from near the Florence is an augite basalt, like the basalt of Siebert mountain at Tono-

intermittent. The quartz itself is gray and jaspery, and is due almost entirely to the silicification of the volcanic rock in which it occurs. Practically no ordinary vein quartz was observed.

Indications show that this silicification (and the accompanying mineralization) is the work of hot springs, and that these irregular reefs represent the horizontal sections of columns of rocks traversed by rising columns of hot water. Had the rocks been strongly fractured we should have had veins like those of the early andesite at Tonopah, which are also due to hot-spring action; but at Goldfield the lack of such a fracture system resulted in this curious and rather unusual type of deposit. It follows that the quartz bodies will probably, as a rule, extend deeper vertically than horizontally, and so have roughly the nature of columns or pipes.

**PAY SHOOTS.**—The greater part of one of these jaspery quartz reefs, although showing disseminated pyrite, contains little or no values in gold. Microscopic investigation has shown that in such quartz the pyrite is often probably mainly indigenous—that is, that the iron sulphide has been formed by the action of the sulphur contained in the hot spring waters upon the iron silicates contained in the hornblende and biotite. This explains the absence of gold, the pyrite having the same origin as the barren pyrite near the ore bodies in the country rock at Tonopah. Within some of these barren reefs of silicified volcanic rock at Goldfield, however, prospecting has led to the discovery of portions containing gold, sometimes in large quantities. Such portions are apt to be lenticular or irregular, like the main quartz reefs, and they are not easily distinguishable from the barren quartz except by panning or assaying; but these shoots are the real ore deposits, and the mass of the reefs constitutes merely a siliceous jacket or casing, such as is known to surround ore bodies in some other parts of the world. While the siliceous casing may be 25 or 30 feet wide the auriferous portion may be only 1 or 2 feet, and the form and extent of this portion become evident only after the ore has

nature of the free gold particles in such oxidized material completes the proof that this is gold that has been dissolved and redeposited in concentrated form during the process of oxidation. Iron sulphate derived from oxidation of the pyrites is the probable agent. A peculiar yellow coating, pointed out to the writer as the best sign of values in the oxidized ores, was shown by Dr. Hillebrand to be a basic ferric-alkali sulphate, containing both sodium and potassium—perhaps jarosite. Other sulphates, such as alum and gypsum, are abundant. These oxidized ores are prepared for shipment by screening, the fines being shipped and the coarse quartz rejected. This is a rather crude method of treatment. Some specimens of ore from the waste or low-grade dumps have been found by the writer to show under the microscope a large amount of free gold.

**RICH SULPHIDE AND TELLURIDE ORE.**—As the ground-water level at Goldfield is usually high for this desert country, water having been encountered in several shafts at from 150 to 200 feet, it is plain that this oxidized ore is only a temporary supply. In the Combination and Florence mines, however, sulphide ores of very high grade have been encountered below the oxidized zone. In these mines a dark-gray copper-bearing mineral is most intimately connected with the gold, being very rich. A specimen from the Combination, analyzed by Dr. Hillebrand, proves to be a sulpho salt of copper, antimony and arsenic, which, so far as qualitative composition goes, may be tetrahedrite. Tellurium is also present in this ore; and the same element has been reported elsewhere in the district. Therefore the sulphide ores may also be very rich. Moreover, while the difference between the oxidized and unoxidized portions of the ores within the oxidized zone is in general so great, certain shoots occur in the oxidized zone, as in the January and the Jumbo, where the unoxidized quartz is of extremely high grade. Such ore appears to contain mostly pyrite as metallic mineral, but in view of the fact that tellurium is known to be present in the district, it is probable that gold telluride is present.

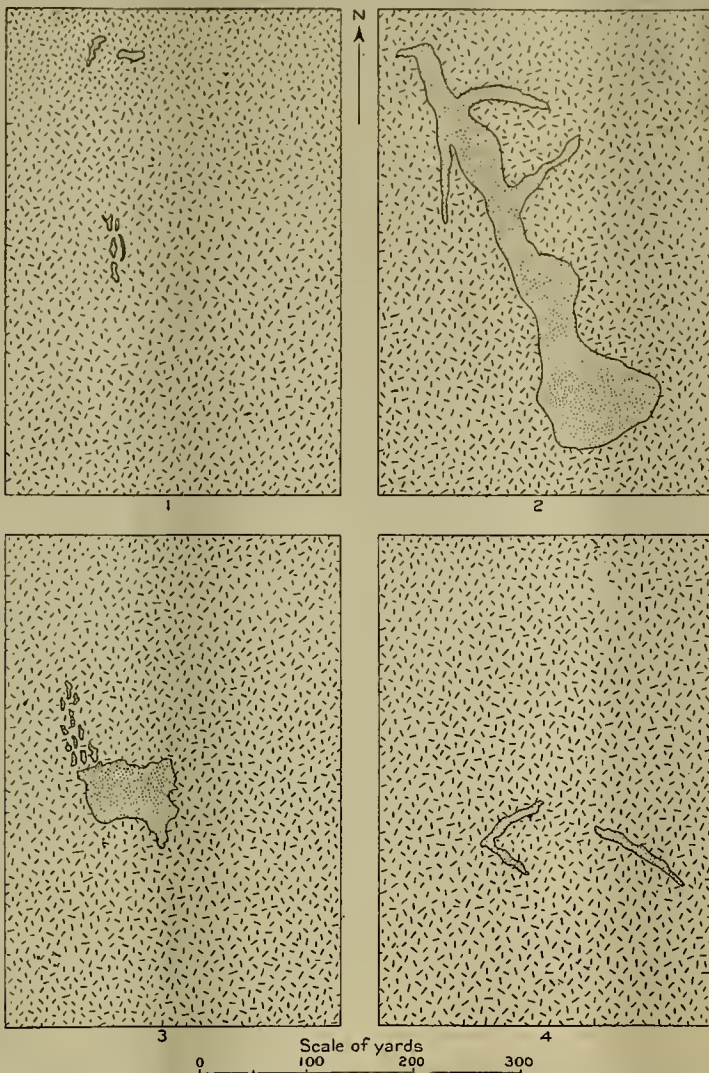


Dr. Hillebrand has determined tellurium and gold (probably gold telluride) as well as a copper mineral in a specimen of ore of this class from the January mine. These are probably residual minerals similar to those characteristic of the unoxidized zone, as microscopic work by the writer indicates. Most of the hard quartz in the pay shoots of the different mines shows, when thus examined, pyrite, tetrahydrite (?) and free gold, the last two closely associated and often intergrown. The tellurides have not yet

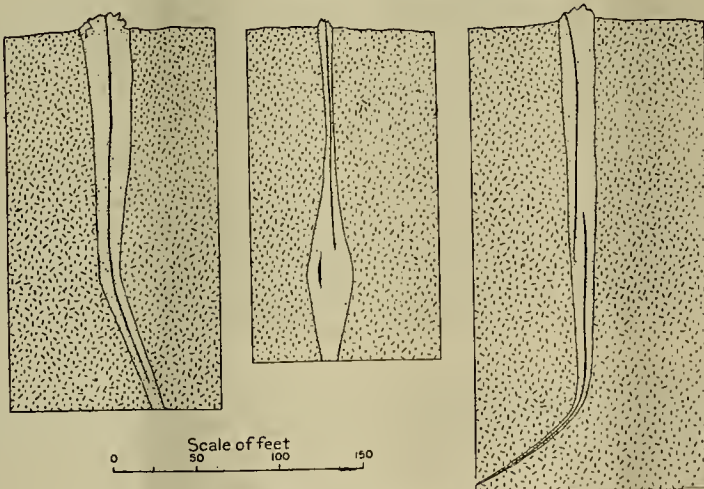
sult of descending or ascending waters. Concerning this the evidence is not conclusive; but there is no sufficient evidence that these rich ores have been concentrated from the lean antecedent quartz mass, and the presence of elements like arsenic, antimony and tellurium in the subsequent sulphide ore suggests a deep-seated origin. Moreover, microscopic examination of such rich ores shows they have as gangue cherty silica like that of the first period of silicification, and the associated evidence favors the idea that

not unfavorable to the continuance of ores of high grade, or at least of good grade, down to considerable depths. There is, however, as already demonstrated by exploitation, no continuous regularity to the ore shoots, whether sulphide or oxidized. They are curving, irregular and often lenticular, but it may happen that below a shoot which has come to an end another shoot may be found occupying a slightly different relative position, or even overlapping the first.

The engravings accompanying this article are furnished through the courtesy of Mr. John D. Hoff of San Francisco, Cal.



Vagaries of Ore Deposition at Goldfield, Nevada.



Type of Vein Formation at Goldfield, Nevada.

been identified microscopically, probably because of the difficulty of distinguishing them from pyrite.

It appears, then, that the rich oxidized ores owe their richness, not primarily to concentration during oxidation (though this process has certainly been very important), but to the existence of shoots of rich antecedent (sulphide) ore.

**PROBABILITY OF RICH ORE IN DEPTH.**—Concerning the origin of these rich sulphide ores, it is probable that some, so far as can be yet seen, are purely primary, while evidence points out other cases as having been formed subsequent to the main silicification of the reef, as in the Combination mine. Here the rich auriferous sulphides have formed in a broken zone (breccia zone) in the silicified barren reef, and occur as seams and often as coatings on the pebbles in the breccia. The question arises, however, as to whether this subsequent mineralization was the re-

sult of descending or ascending waters. Concerning this the evidence is not conclusive; but there is no sufficient evidence that these rich ores have been concentrated from the lean antecedent quartz mass, and the presence of elements like arsenic, antimony and tellurium in the subsequent sulphide ore suggests a deep-seated origin. Moreover, microscopic examination of such rich ores shows they have as gangue cherty silica like that of the first period of silicification, and the associated evidence favors the idea that

the conditions of this subsequent deposition were very much like those of the first. Besides the elements mentioned above, bismuth occurs in the ore. In the January mine it occurs in the oxidized ores in the form of silvery scales, which is, as described by Dr. Hillebrand, bismuth; perhaps the oxide bismite. In the Combination long needle-like crystals have been found, which, according to the manager, Mr. Collins, give the chemical tests for bismuth sulphide (bismuthinite). In the January mine the silvery mineral above noted is sometimes arranged in long rod-like forms, and these are very likely pseudomorphs after the sulphide. This silvery mineral is usually, but not always, an indication of rich ore in the January. According to Mr. Hamilton, several of the Blue Bull samples show bismuth. Barite is a common mineral in all these deposits, but is not abundant. The indications are, therefore,

## Personal.

H. A. PRINGLE has returned to England from Rhodesia.

A. B. FRENZEL of Denver, Colo., has been in New York City.

H. E. WOOD has returned from New York City to Denver, Colo.

C. W. PURINGTON has been examining mines at Eureka, Colo.

CHAS. TAYLOR is superintendent El Oro mine at Poza, Sonora, Mexico.

A. E. HUMPHREY has returned to Butte, Montana, from Salt Lake City, Utah.

R. C. GEMMEL of Salt Lake City, Utah, is examining mines in Zacatecas, Mexico.

SAMUEL NEWHOUSE has returned to Salt Lake City, Utah, from an Eastern trip.

J. W. CRAIG is manager Tudor G. M. Co., Ltd., at Luipaard's Vlei, South Africa.

R. HOPKINS has charge of work at the California mine, near Silver City, Idaho.

N. TRELOAR has been made general superintendent Yampa mines at Bingham, Utah.

T. JAY has resigned as foreman Jumho mine, Hump, Idaho, being succeeded by N. McGree.

W. E. MILLER, secretary of the Arizona C. Co., has left Morenci, Ariz., for his home in Scotland.

O. B. WARD has been appointed metallurgist to the Sons of Gwalia, Leonora, Western Australia.

E. GRIBBEN has been appointed manager Durham Consols mine at Etheridge, Queensland, Australia.

O. Will of Salt Lake City, Utah, has taken charge of work on a silver-lead property near Hailey, Idaho.

C. H. DOOLITTLE, manager Bingham-New Haven M. Co. at Bingham, Utah, has been in New York City.

A. F. ROGERS has been appointed assistant professor of mineralogy and petrography at Stanford University, Cal.

E. B. WILSON has been appointed dean of the faculty of applied science at Columbia University, New York City.

P. L. FERN of New York City has been examining mines for the United States M. Co. of Idaho at Bingham, Utah.

W. J. HOLDEN AND H. W. HOLDEN of Cleveland, Ohio, are at the Dutchman mine, near American Fork, Utah.

R. B. WATSON, consulting engineer of the Shannon C. Co. at Clifton, Ariz., has gone to Mexico on mining business.

M. PAGE has been made superintendent Republic mine, at Parrot's Ferry, 7 miles from Sonora, Tuolumne county, Cal.

M. J. HENEY, who has finished building the White Pass & Yukon Railroad in Alaska, has returned to San Francisco, Cal.

J. M. MCCLAVE, Denver, Colo., has charge of the construction work of the new zinc plant being built at Salt Lake City, Utah.

P. MIXSELL of Idaho Springs, Colo., has returned there from examining mines at Tonopah, Nev., and from a trip to San Francisco.

D. C. TOBIN, superintendent, has returned to the Continental mine, at Vulcan, Colo., from a trip to Denver, Leadville and Cripple Creek.

J. C. DUFRESNE has severed his connection with the Amalgamated G. M. Co. at Quartzsite, Ariz., and is examining mines near Mexico City, Mex.

A. H. ROGERS has resigned as manager Velardena M. & S. Co. of Durango, Mexico, to take up work as consulting engineer in New York City.

R. J. GRANT, who has resigned the management of the Cosmopolitan Proprietary, Niagara, Western Australia, has returned to the United States.

FRANK PARRISH AND ROBT. ANDERSON, the latter a former superintendent of the Le Roi mines at Rossland, B. C., have been examining mines near Park City, Utah.

A. T. CHARLTAN, a cyanide man of the Black Hills, representing Evans & Fennox of Colorado Springs has been examining the Continental gold mine at Vulcan, Colo.

W. H. BUELE, who was superintendent concentrator at the North American Copper Co.'s works at Encampment, Wyo., is now superintendent Cripple Creek Homestake M. & R. Co.'s cyanide mill at Cripple Creek, Colo.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

The copper production during 1904 amounted to 812,537,267 pounds, valued at \$105,629,845. The production for 1903 was 698,044,517 pounds. The most noteworthy increase occurred in Arizona, where both the Bisbee and Globe districts added largely to the product. The imports in ore and matte amounted to 38,947,772 pounds; the imports in bars, ingots and old bars to 142,344,433 pounds. The exports of copper amounted to 564,544,880 pounds, an increase over the exportation of 1903, which was only 326,322,627 pounds. The amount of copper consumed in the United States during 1904 was 485,284,592 pounds, a decline from the figure for 1903, which was 566,429,885 pounds. The production of merchant lead from the mines of the United States amounted to 307,000 short tons in 1904, valued at \$26,402,000. The yield in pig lead from ores smelted by works that treat argentiferous material is estimated, after undergoing the smelting, desilverizing and smelting operations, at 95% of the contents of the ores. The result is a tonnage of 218,000 for 1904, as contrasted with 199,000 short tons for 1903. To these figures are added 89,169 tons of soft lead for 1904 and \$3,444 tons of soft lead for 1903, making an approximate total of 307,000 short tons for the lead production of the United States in 1904, as compared with 282,000 short tons for 1903. Returns from all the producers of spelter in the United States show that the production for 1904 amounted to 186,702 short tons, valued at \$18,670,200. The production of 1903 was 159,219 short tons. This extraordinary increase in output was due chiefly to the growth of the industry in Kansas, where a number of new plants built in 1903 were in full operation.

### ARIZONA.

#### Cochise County.

(Special Correspondence).—The Bisbee Queen mine, in the Warren district, has been sold to E. E. Dennis of Michigan. Bisbee, June 12.

#### Cocconino County.

The asbestos deposits in the Grand Canyon of the Colorado river, Arizona, belong to the Hance Asbestos M. Co. of New York City, and are on the north side of the Colorado river, 70 miles west of north of Flagstaff, the county seat. The deposits are near the bottom of the Grand Canyon, 4900 feet below the rim, with a portion of the property rising to 1500 feet above the river. The nearest point on the railroad is Grand Canyon at the terminus of the Grand Canyon railroad, which connects at Williams, a distance of 63 miles, with the main line of the Santa Fe railroad. There is a good wagon road from Grand Canyon station to the head of Grand View and Red Canyon trails, which lead from the rim to the bottom of the canyon and are 14 and 19 miles respectively from Grand Canyon station. Both these trails are in good condition, and pack trains could carry from 80 to 100 pounds per burro or from 175 to 210 pounds per mule. Grand View, a United States post office, is on the rim between the two trails. The only present means of crossing the river to the asbestos deposits, which are on the north side, is by rowboat.

#### Gila County.

(Special Correspondence).—The Lost Gulch group, near Globe, belonging to E. F. Kellner, has made a trial run of fifty tons of ore with good results. The Lost Gulch group consists of six claims and is equipped with a 10-stamp mill with crusher, two copper tables, separator, two Frue vanners, 80 H. P. hoiler and 150 H. P. engine; also a 15 H. P. hoist for raising ore from the tunnel track to the upper floor of the mill. Globe, June 12.

Manager E. M. White of the Warrior Copper Co. states that the water has been struck in the well which the company is sinking in the gulch above the works, near Globe, at a depth of 32 feet. Sinking will be continued as long as practicable. As soon as a water supply is assured, mine development work will be begun in earnest.—F. A. Weast, superintendent of Tri-Bullion M. Co., has opened new horizons in the Starlight mine. The main drift is in 1657 feet and an upraise is being made 700 feet to the surface, also a winze is being sunk in good copper ore and the vein crosscut at 1400 feet in the drift.—N. L. Amster, of the Arizona Commercial Copper Co., has been at Globe conferring with Superintendent W. S. Sultan in regard to the development and future operation of the company's mines. Work is being done on the Copper Hill and Black Hawk mines. At the Copper Hill mine the new steam hoist and compressor are working steadily. A track has been laid from the Copper Hill mine to a junction with the United Globe tramway leading to the Buffalo ore house. At the Black Hawk, the shaft has reached a depth of 115 feet and both drifts and crosscuts are being run all in ore. The company has under consideration plans for marketing their ore, or, if found more profitable, erecting reduction works of their own.

#### Graham County.

(Special Correspondence).—The output of the Arizona Copper Co. for May was 1412 tons of copper. The company has about 4000 acres, including mines at Morenci, Metcalf, Longfellow, Garfield and Coronado, the principal mines being the Humboldt, at Morenci, and the Longfellow, which was the first copper mine opened in Arizona. The ore occurs as disseminated sulphides. The mines are worked open-cast and the product is of two grades, one-tenth being smelting ore and nine-tenths concentrating ore. Ore is taken from the different mines over gravity trams to storage bins on the Coronado railroad, which the company operates. Morenci, June 13.

(Special Correspondence).—The output of the Shannon Copper Co. for May was 691 tons of copper. Superintendent Schofield of the Coronado Copper M. Co.

has commenced sinking a double compartment shaft on what is known as the big Coronado vein. Metcalf, June 13.

#### Mohave County.

O. F. Kuencer, superintendent of the German American mines at Acme, reports that the new mill will be dropping stamps about July 15.—The Benedict M. Co. of Washington, D. C., has taken an option on the mines of J. P. Ryan, W. Jennings and others in the Cedar district, and on Aug. 1 are to begin development on a large scale. The mines are near the San Francisco.—O. Stein, who has been unwatering the Tennessee mine at Chloride, reports having opened up a fine body of lead ore on one of the outside claims of the Elkhart group and is working men on it.—It is reported that the crosscut at the 600 level of the Gold Road mine has reached the hanging wall and 40 feet of ore has been cut. The ore is of a high milling grade and more easily worked than the ore above that level.

#### Pinal County.

(Special Correspondence).—The Bunker Hill mining district is 12 miles east of Mammoth. The district has long been held back for the want of railroad facilities. This is about to be overcome and much activity is noticeable in consequence. The Michigan-Arizona M. Co. are operating six claims. Large deposits of copper carbonate and glance ores crop out on the surface of every claim. On close examination there can be found considerable native copper mingled with the ore. Every assessment hole that has been dug shows good ore. A 50-foot prospecting shaft was sunk, with a 20-foot crosscut at the bottom, all in good ore. They are now driving two tunnels from opposite sides of the mountain, and when these are completed they will have nearly 400 feet of tunneling in the ledge, with nearly 200 feet of stoping ground. Two shifts are driving the work and, as soon as sufficient ore is blocked out, they will build a smelter at the mine. The home office is at Safford, Ariz., and stock office at Muskegon, Mich. One mile north from the above property are eight claims, owned by C. Dixon and P. Figueroa. On the Black Metal there is a 25-foot ledge, which averages about 10% copper, with gold and silver. The Silver Bell has an 18-foot ledge on the surface and carries 12% copper. The Monarch has a 20-foot shaft which is in carbonate ore, averaging about 15% copper. To the north, 3 miles, is the Giant group, owned by Clark & Scanlin. It consists of five claims, with a mineral zone 300 feet wide, on which have been dug eleven shafts varying from 10 to 75 feet in depth, and all show good copper ore running from 10% to 60% in copper. In a southerly direction are two claims owned by the above, on which was a 35-foot shaft, the bottom of which was connected with a 50-foot tunnel. This work had uncovered an 8-foot ledge carrying 25% lead and 60 ounces in silver. To the northeast the Concordia group, consisting of three claims, is near the head of Copper creek, and owned by Clark & Morgan. From a 3-foot ledge two trial shipments were made, running 28% copper, 46 ounces silver and \$5 gold. Near this is the Sibley M. Co., operating a group of twenty-five claims. They are taking out some high-grade copper ore carrying silver. A wagon road is now under construction. They contemplate installing a smelter the coming fall. The two claims held by Alex. Rosi, lying between the Clark and Sibley groups, made a sample shipment from a 12-foot ledge which returned 40% copper and 140 ounces silver. The Hawkins group, close to the Giant group, is rich but small. A shipment returned a large percentage of lead and 1500 ounces in silver. Adjoining the Giant group is a claim owned by E. W. Childs of Mammoth, which is rich in lead, with a small amount of silver. From this a shipment was made showing 60% lead and 20 ounces in silver. He has three claims which adjoin the Giant group which carry copper. The two claims owned by J. Keigle adjoining the Giant group have the same formation and copper values as the Giant group. J. Mercer holds the Old Smelter mine, which was worked years ago by the Mexicans. In the face of a 60-foot tunnel is a 30-inch ledge high in silver. Much of this ore was smelted in the early days in an old adobe smelter on the San Pedro river. R. M. McKinney & Son hold the Longstreet copper mines, located on Copper creek. A tunnel 25 feet and a shaft 15 feet are in ore running from 5% to 40% copper.

There are some important negotiations pending on some of the above properties, and the construction of the railroad, which will be completed this year, leads to the conclusion that there will soon be much activity in the district, although there are only two companies in active operation at present, the Michigan-Arizona M. Co. and the Sibley M. Co.

Safford, June 12.

E. R. Stafford, superintendent of the Arizona-Pacific Copper Co., 7 miles south of Kelvin, states that the shaft is down 320 feet and a crosscut at the 300-foot level has cut an ore body that is 22½ feet wide. The shaft will be sunk several hundred feet deeper. Two 60 H. P. boilers, a 35 H. P. steam hoist, a 50 H. P. compressor and an electric lighting plant capable of furnishing 200 lights have been put in at Woolley.

#### Yavapai County.

Work has been resumed at the Peck mine, near Prescott.—F. A. Bowman is working the Rainbow group in the Bradshaw mountains, south of Prescott.—The shaft of the Bauman Copper Co. in the Agua Fria district, 2½ miles from Val Verde, is being sunk 4 feet per day. The company has 500 acres, showing fissure veins carrying sulphide ores giving values in copper, gold and silver.—New machinery has been put on the Little Jessie group, near McCahe, by J. S. Jones.—H. A. Kendall, developing the properties of the Yavapai Copper Co., near Prescott, states that W. F. P. Fogg intends to explore the properties with diamond drills and also drive a tunnel through the Black Hills, to allow the cars of an electric railroad to pass through—this road to traverse Lonesome valley and connect the Verde valley and Prescott.

The Congress mill, at Congress, has forty of its eighty stamps dropping on ore from the mine.

#### Yuma County.

(Special Correspondence).—The Amalgamated Gold

Mines Co. have closed down their mines at Quartzsite, pending the result of a lawsuit.

Quartzsite, June 12.

A. J. Morse is putting up a cyanide plant at the Bonanza mine, near Harqua Hala.

The Socorro mine, at Harrisburg, has twenty-five men opening up new ground and stoping ore. The remodeled 20-stamp mill has been running since May 1.

### CALIFORNIA.

#### Amador County.

C. L. Maze has been working on the chlorination dump of the Kennedy mine near Jackson. These tailings contain from \$5 to \$10 per ton in gold.—The Madrone mine, near Jackson, in the Pioneer district, is being worked by C. F. Leslie and J. Fredericks.

#### Calaveras County.

A rich strike is reported as the Royal mine at Hodson. On the 100-foot level a cross vein which has been traced to the surface was located. It is said to be 50 feet wide on the 500-foot level. This lies above the flat vein and is between the diabase and slates. An English syndicate, represented by J. C. Kemp Van Ee, controls it, though J. H. Brotherton recently secured a judgment for one quarter of the mine. J. T. Hodson owns a half interest.—The Yellow Boy M. Co. will start work on the Red Gold and Gum Boots mines near Murphys. Campbell and C. V. Zinn of Murphys are interested.—Good ore has been found at the Hercules Horseshoe mines at Indian creek, near Murphys. L. L. Washburn has charge. The mill has been running.

#### El Dorado County.

The Mameluke Hill hydraulic mine, which has closed down on account of a large landslide in the mine, will not resume operations until next fall. Superintendent Sargent states that the Loon Lake Water & Power Co. could not guarantee to furnish the mine with the required amount of water to continue operations during the summer months.

#### Mono County.

Reed Smoot of Salt Lake City; L. L. Nunn, manager of the Power Co. at Telluride, Colorado, and L. Holbrook of Utah, have purchased the Syndicate mines near Bodie. They will establish a large power plant on the Walker river, and will operate mines on a large scale. The Syndicate mine is on the north slope of the Bodie ridge, 1 mile from Bodie. The Syndicate tunnel cut through 200 feet of volcanic breccia before reaching the andesite in which the veins are found.

#### Nevada County.

Work has been started on the new 10-stamp mill at the Chicago mine, near Grass Valley, which is expected to be finished by August 1st.

G. Baldwin has bought the Manhattan mine at Gold Flat, near Nevada City, to Moss & Co. of San Francisco. The holders propose to commence active work on the mine and will sink a new shaft. The old shaft is down 270 feet.

A new gallows-frame and a large ore bin are being put up at the New Orleans mine, near Grass Valley. Good progress is being made on the trench for the water pipe from the Sultana.

The Springhill Con. M. Co. has been formed to develop the Springhill mine near Grass Valley, and the management is negotiating with the owners of the Maryland mill for the use of its plant in milling their ores. G. B. McDonald of New York is president, J. A. Kirby of Utah vice-president and W. A. Byrne of Salt Lake City, Utah, secretary and treasurer, C. B. and J. M. Lakenan of Grass Valley directors.

#### Placer County.

F. Armstrong of Grass Valley, superintendent of the Golden West gravel mine at Canada Hill, east of Westville, is starting work and will run three shifts during the season.—H. Blagrove, superintendent of the Canada Hill Quartz M. Co., is running a double shift, six men, on their mine and mill.—The Tadpole mine, near Secret House, the Black Canyon mine and the Santa Fe mine are being opened up.

#### Shasta County.

The new 5-stamp mill of the Marina Marsicano M. Co. at the Sunny Hill mine, near Ono, has been started. L. F. Barlow reports satisfactory results. A new Pelton wheel is being put in to furnish power for the air compressor, which operates the drills in the mine. Work on the proposed cyanide plant below the mill will not be begun until all the other work has been completed.

The Bullychoop mine, west of Redding, is to be reopened and operated by a company of which W. R. Beall is the manager. J. S. Stevenson is assayer.

#### Sierra County.

C. C. Weisenherger of Nevada City is at the Two Counties mine, south of Alleghany, building a 5-stamp mill.—The upraise from the new tunnel of the Oriental mine, south of Alleghany, has been connected with the 400-foot incline shaft from the surface. The lower tunnel was started from Kanaka creek, 800 feet vertically below the shaft, and was run 4000 feet to the vein; 3500 feet of it is straight and without a stick of timber. It is 9 feet wide and 7 feet high. The upraise is over 700 feet long. H. L. Johnson is superintendent.

#### Siskiyou County.

J. E. McBride, one of the principal stockholders in the Headwaters mine at Humbug, and J. H. Tihitts of Redding have started work at the mine.—Superintendent Wardner, of the Mono mining claim at Punch creek, near Yreka, is prospecting and developing the Jenny Lind group of mines adjoining the Mono on Humbug. The Mono Co. intend constructing a cyanide plant.

#### Sutter County.

Assays of drillings in gold-bearing sands on W. T. Phipps' land near O'Banion Corners have proved so low that the sands cannot be profitably treated at present.

#### Tuolumne County.

F. McPherson and a company has started work on the Hazel, on the East belt, near Columbia. The old shaft, 200 feet deep, will be cleaned out and a new shaft will be started, 200 feet north of the old one.—It is reported that W. A. Nevills will start the pumps at the Moody mine, near Big Oak Flat, preparatory to resuming work.



## COLORADO.

The three forest reserves heretofore known as the Pike's Peak, South Platte and Plum Creek forest reserves have been consolidated into the Pike's Peak forest reserve, with the inclusion therein of additional areas and the elimination of a small tract, and two additional adjoining reserves have been established, the Leadville forest reserve and the Gunnison forest reserve. The Pike's Peak reserve embraces 1,581,667 acres, the chief expansion having been made on the north, to include a region around Mount Evans of 279,730 acres, with a view to remedying, in the interest of the city of Denver and the South Platte valley, the shortage of water in the South Platte river, which has long been an increasing trouble as the region develops. The Leadville forest reserve embraces 1,219,947 acres, and includes all of the Arkansas river watershed lying north of the south line of township 51 of the New Mexico principal meridian, and the watersheds of the Blue and Williams fork rivers, in the counties of Grand, Summit, Lake and Chaffee. It contains the highest and most important mountain area in the State. In length this general tract extends 100 miles, including the town of Buena Vista on the south and extending almost to Sulphur Springs on the north, with an average width of 25 miles. The valley of the Arkansas river, in which Buena Vista is located, and that of the Blue river have been excluded from the reserve. The establishment of the Leadville reserve is of importance to the mining industry, since the need for carefully controlled use of the remaining timber is of vital importance to such mining districts as Leadville, Breckenridge and Montezuma, which are within its limits. The Gunnison forest reserve includes 901,271 acres of the Gunnison river watershed in Gunnison, Delta and Montrose counties. The chief object of the reserve is to insure the success of the Uncompahgre valley irrigation project.

## Clear Creek County.

The Moscovite mine, on Democrat mountain, near Georgetown, has been bonded and leased to S. H. and R. D. Clift of Denver, who will start work on it.—The Domingo M. Co. will develop the Domingo claims in the Argentine district. The tunnel is in 270 feet. The company has made arrangements with the East Argentine Co. for the power with which to operate power drills. The incorporators of this company are H. J. Crist and H. Cochran of Georgetown, and Zimmerman Bros. of Marshallville, O.—F. A. Maxwell has sold to the Gold Fissure G. M. Co. the Annex, Gold Fissure, Gold Dirt No. 2 and Laura Doano lodes, in the Empire district.—The New Era mine at Freeland is running steadily, supplying ore for the 40-ton mill recently started. J. R. Elgan of Denver is superintendent.—The Nabob claims, on Columbia mountain, is being operated by C. W. Benkleman of Denver and G. Pease of Georgetown. The lower level has been driven 1100 feet and the upper level 1300 feet.—High water recently washed out the dump at the Seven-Thirty mine, near Silver Plume, filling with debris the blacksmith shop, the oil and tool rooms and the boiler room. It also washed away part of the flume and covered the floor of the orehouse with water.

R. C. Vidler has ordered for the Vidler tunnel, near Georgetown, an 80 H. P. boiler; a filter for the mine water; an air receiver 10x4: 1000 feet of 10-inch air-pipe; small horizontal engine to be used in running an exhaustor; 2000 feet of 3-inch wrought iron pipe for the compressor, capable of furnishing 500 feet of air; and model No. 5 water-Leyner drills. The tunnel will be equipped with 16-pound rails. The Vidler tunnel is in 700 feet and during the work seven veins have been cut. Superintendent L. W. Vidler expects to increase the force.

The Commodore M. Co. has started work on its tunnel, into Red Elephant mountain, near Lawson.

## Gilpin County.

The Colorado M. Co. has been formed by Centerville, Iowa, parties with C. A. Farrington president, J. R. Needham vice-president, and F. Augustus secretary, to work claims in Gambell gulch. It is reported that O. J. Duffield of Rollinsville will be manager.—The machinery on the Hope and Parker claim in Phoenix district has been moved to the Gold King mine in Moon gulch, which has a shaft down 100 feet and is owned by G. Carle of Denver.—The Silver Lode in Moon gulch has been leased and bonded by Potter & Lightbourn of Central City to W. G. Smith and W. H. Knowles, and arrangements are being made for putting in machinery for the unwatering of the main shaft, which is reported to be down 150 feet.—J. A. Gilmour of Central City has ordered a new shaft building, to be 20x40 feet, and a 25 H. P. hoist and boiler for the Daisy extension on Perigo hill. The shaft is down 125 feet and Gilmour expects to sink it at least 100 feet as soon as the surface water is out. Shipments will be made to the Daisy mill in Gambell gulch, which is equipped with fifteen slow-drop stamps, tablos, bumpers, etc.—At the Castleman mine, near the head of Virginia canyon, W. M. Kirk of Russell gulch is working chiefly in the 300-foot levels. The shaft is down nearly 400 feet, one lift of 100 feet being sunk with three eight-hour shifts in twenty-three days. They expect to resume sinking to the 500-foot point. Drifts are to be extended at a depth of 400 feet as soon as the shaft is freed from water. The Lucania tunnel being driven in from Clear Creek will cut under this property at a depth of less than 1000 feet and about 800 feet west of the main shaft and it is believed that this will solve the drainage problem and will in the future, when the Castleman workings are down to the same depth, furnish them an exit for their shipments, furnishing cheaper transportation and also cheaper mining operations through the drainage of surplus water.—H. B. Gilbert & Sons are working the Star of Gilpin mine in the Russell district under a three-years' lease and bond. They are drifting west at a depth of 150 feet and are also uprising to the 100-foot workings for air connections, having been troubled with bad air.—It is reported that heavier machinery is to be put on the Golden Cloud, at the head of Virginia canyon in the Russell district by Potter & Hawley of Central City. The main shaft is down 500 feet, and, on account of surface water, operations have been handicapped because of

banding the additional water. Concentrating ores are being taken out at the 200-foot workings and are being shipped to Idaho Springs.—It is reported that the Franklin mill, east of the Black Hawk depot, is to be started up and that a cyanide process will be put in to handle ores from the Pine Creek and surrounding districts.

G. W. Goodyear of Central City has purchased from W. F. Thick of al. one-third interest in the After Supper mine, in Enterprise district, near Black Hawk, for \$7000. The After Supper lode is considered to be an extension of the Fisk and Sleepy Hollow leads and is being operated by the Banzai M. Co.—The Gower Mines Syndicate, Ltd., has purchased the Bant lode, in Gregory district, southeast of Black Hawk, for \$1300.—The Modoc mine, on Quartz hill, near Nevada, is being operated under lease and bond by the United Exploration Co., with F. Straub of Denver as manager. Stopping operations are being carried on in the 200-foot east and west levels, where the ore bodies have been opened up for a width of 25 feet. Ore is being shipped to the Hidden Treasure mill. The company will soon put in heavier machinery and larger shaft buildings. The shaft is down 230 feet, but no sinking operations will be carried on for some time, as there is enough ore in sight to last for a number of months.—The Elizabeth G. M. Co., operating the James Henry mine, have men on the 200-foot level sinking a winze in ore, which will be prospected before extending the 300-foot level under it.

## Gunnison County.

Work has been started on the Bellview Mt. mine, near Crested Butte. A. J. Vagg and C. W. Espey of Chicago, Ill., have been at the mine.

## Hinsdale County.

The Lone Star mine, near Lake City, has struck high-grade ore.—The Moro & Ajax Co. are rebuilding and enlarging their mills at Capitol City, and will soon be able to make a large output from their Moro and Ajax mines. The mine and mill are connected by tramway. A pipe line and power plant are to be constructed during the present season, which will lessen the cost of production in both mine and mill. This property is 11 miles from Lake City on Henson creek, near Capitol. G. H. Martin of Chicago is general manager.—The Hidden Treasure mine, under lease to L. Kafka of Lake City, is working a full force on both mine and mill. The mine is worked through a shaft and seven levels are opened. The mine and mill are connected by tramway. P. C. McCarthy has charge.—The Waldron property, in the Mineral Point district, near the headwaters of the Animas river, is owned by the Adelia M. Co. The shaft is 250 feet deep.

J. D. Irving, in describing the ore deposits near Lake City, says that the deposits are along the course of Lake Fork to 5 miles south of Hinsdale and along Henson creek westward through Henson and Capitol City for 10 miles, chiefly in the stream bluffs. Henson creek cuts through rhyolite flow breccias characterized by undulatory banding and inclusions of rhyolite and other rocks. These are intruded by andesite porphyries appearing as irregular dikes. Irregular beds of volcanic tuffs and agglomerate become more numerous to the south. The rock series is traversed by numerous faults, at some places heavily mineralized. The ores are found in silver-bearing fissure veins and in gold-bearing fissure veins. The ore minerals of the silver-bearing veins are galena, tetrahedrite, chalcopryite, sphalerite and pyrite.

## Lake County.

At the Forest City, Little Ellen hill, near Leadville, the drift from No. 2 shaft is being driven ahead to make connections with No. 1 shaft, which will give the mine good air. No. 1 shaft is close to the end lines of the Winnie, and it is expected that before the drift reaches this distance the Winnie ore channel will be cut. At the Izard's new shaft satisfactory progress is being made.—Prospecting is still being done at the Triumph, at Leadville.—The Sedalia shaft, near Leadville, has been unwatered and the ore bodies in the lower levels are being worked.

## San Juan County.

J. Pilling has resumed operations on his claims on South Mineral creek, near Silverton.—The Gold King Con. M. Co. of Silverton is shipping seventy-five tons of concentrates daily to the smelters.

O. S. Olson & Co. have resumed work on the Early Bird mine on Houghton mountain, near Animas Forks.

## San Miguel County.

A good strike has been made in the Japan-Flora mines in Savage basin, owned by the Japan-Flora M. Co. While drifting north on the Japan vein in the lower workings in the direction of the Flora, a cross lead was encountered which carries from 10 inches to 3 feet of silver and lead ore, with some gold. A new mill will be built at Pandora, 2 miles above Telluride, at the head of the valley, where the Smuggler-Union mills are located, and will be connected with the mines by an aerial wire rope tramway 2 miles in length.

## Summit County.

The Victoria of the Masontown M. & M. Co. on Royal mountain, near Frisco, has been opened by an adit tunnel for 600 feet. The ore is stamped, amalgamated and cyanided in a 50-ton mill.—On the same mountain the Copper Queen, owned by Memphis people, is being worked with twenty men.—On Wichita mountain, opposite the Copper Queen, the Excelsior mine is opened by adits. The company has a concentrator near the mine capable of handling 80 tons daily. The ore is a lead-copper sulphide.—The Admiral Co., operating in Ten-Mile range, 3 miles above Frisco, is preparing to pipe most of the water in Ten-Mile creek to generate electric power for all the mines in that region.

The Abundance M. & M. Co. has put in a new pump, boiler and water line to supply water for the boiler at the hoisting plant.—The Sarsfield, the Washington and Modoc mines at Montezuma have been merged into one group by Chicago parties under bond and lease. The work at the mine is in charge of J. Sutherland.—The Clarion mine at Montezuma is being started up by C. H. Campbell and associates.—C. W. Smith has six men at work in the Silver Wing, near Montezuma, taking out some good zinc ore.—T. Connors will re-

open the Wild Irishman at Montezuma with machine drills.

The Morning Star mine, on Mount Baldy, near Breckenridge, and owned by W. P. Conlon, has been started.—The leasers of the Rose of Breckenridge have found zinc ore in the upraise above the drift on the main tunnel level.—At the Summit Banner Placer Co.'s workings, 2 miles north of Breckenridge, men are enlarging and repairing the dam, building flumes, clearing right-of-way for a 3800-foot pipe line and clearing out old ditches.

## Teller County.

Lessee Smith has started work on the Sentinel claim on Raven hill, Cripple Creek, which has been shut down because of surface water.

The Havana-Clyde G. M. Co. has acquired by purchase the Raymond, Dakota and Fannie A. claims, near Clyde. E. J. Leach has been appointed resident agent of the company at Cripple Creek.—McDonnell & Long, who have the Elkhorn on Tenderfoot hill, Cripple Creek, under bond and lease, are sinking. The shaft is now 450 feet deep.

The Exposition Mines & Leasing Co. is moving the hoist from the Caledonia mine to the Los Angeles mine, near Cripple Creek, preparatory to taking out ore from the 900-foot level. This will be treated in the cyanide plant now almost completed.—Good speed is being made by the Omaha Leasing Co. in its shaft sinking on the Norfolk claim of the Empire State G. M. & M. Co. of Ironclad hill, Cripple Creek. Sinking was started near the surface. A recent measurement shows a depth of 135 feet. As soon as hard rock is reached a lateral will be started, but the shaft will be continued to the 300-foot point. O. M. Deemer of Omaha, Neb., is manager of the leasing company.

Sinking has been resumed in a winze on the Morning Star claim of the Acacia Co. on the northeast slope of Bull hill, Cripple Creek.—F. Bowen and associates are prospecting at the 400-foot level of the Kitty Lane property of the Gould Co., Cripple Creek.—The Black Diamond and the Friday on Tenderfoot hill, Cripple Creek, have started shipping.—The Golden Cycle M. Co. will sink the 1000-foot to the 1100 level. Five shoots in the Golden Cycle have been opened for stopping on all levels between the surface and 800-foot level. Crosscuts have been driven on the ninth and tenth levels showing the same bodies.

C. L. Cleaver is putting in a washer to treat the dump of the Henry Adney mine on Beacon hill, Cripple Creek.—It is reported that sinking is to be resumed from the 265-foot level of South Burns block, which is being worked by the Exposition M. & L. Co. They are hauling the machinery of the Wrockloff shaft of the Acacia Co. to the South Burns.—The El Paso Co. will start up the Beacon Hill-Ajax mine, near Cripple Creek.—J. S. Murphy, operating on the Monte Cristo, on Beacon hill, has the shaft down 350 feet and has a good vein.—The City of Cripple Creek G. M. Co., which is operating under the city, continues sinking at the Meise shaft, on the corner of Fourth and Myers avenue. As soon as the shaft has reached a depth of 500 feet, lateral work will be started. The company is also sinking on the Maid of Orleans claim, on Beacon hill. Work at a depth of 400 feet has been started—sinking another lift of 100 feet—when crosscutting will be started to reach the El Paso, Old Gold or C. K. & N. dikes.—It is reported that work is to be resumed on the Golden Wedge property, on Raven hill. The shaft is down 350 feet.—F. G. Conover is working east of Goldfield on Big Bull mountain.—Webster and associates, operating under lease the International claim on Gold hill, Cripple Creek, are working on a 3-foot vein at a depth of 350 feet, sinking a winze to the 400-foot point.—The Fort Pitt Co., operating the Sunshine claim, on Galena hill, will sink the main shaft an additional 300 feet, which will give a total depth of 800 feet. The mine is the most northeasterly producing mine in Cripple Creek.—Operators in the Maid of Orleans claim, on Beacon hill, have commenced sinking another lift of 100 feet on the claim, which will give a total depth of 500 feet.—The cyanide mill which is being built by the Little Giant M. & M. Co. in Tony gulch, 3 miles from Cripple Creek, is nearly completed.

A heavy flow of water has been struck in the C. K. & N. mine, Cripple Creek district, which has caused a suspension of operations in the bottom of the shaft, which had reached a depth of 860 feet when the round of holes fired cut the water seam. It is stated that the water rose in the shaft in four hours to the 740-foot point. As there is no adit through which this water can be drained without pumping, the management is considering the advisability of putting in heavy pumps, particularly as this unexpected flow of water is thought to indicate the proximity of an ore body of good size. This latest flow of water indicates the necessity of the proposed deeper drainage tunnel.—At the El Paso shaft sinking continues. The pumps are handling a large amount of water from the C. K. & N. workings.—A leaser on the Independence has struck a lead in which there is a rich pay streak. The management is endeavoring to oust the leaser, who has sued for an injunction restraining the company from depriving him of his lease.

## IDAHO.

## Boise County.

Blaine & Co.'s dredger, near Placerville, will probably be ready for work by August 1.—It is reported that the owners of the Mineral Hill mine, near Quartzburg, will put in a hoist and start production.—The old Iowa 10-stamp mill is being hauled to the Belshazzar mine, near Quartzburg, by D. E. Coughanour.—The Gold Hill mine, near Quartzburg, is being unwatered preparatory to running a tunnel from its shaft to open up the Iowa.

G. Z. Edwards, superintendent of the Lincoln mines and mill in the Pearl district, reports good progress on the new cyanide plant. The new shaft is down 340 feet, with a crosscut being extended to the ledge.

## Idaho County.

The management of the Gold Reef M. & Dev. Co., whose properties are on Thunder mountain, near Roosevelt, has closed a contract for a plant with which to reduce thirty tons of ore daily. C. E. Croh is directing



operations at the property. The lumber for the mill is being turned out at the company's sawmill in Thunder Mountain.

J. B. Whitlock, superintendent of the H.-Y. mine at Roosevelt, in the Thunder Mountain district, states that there is much work going on in the district. The roads are almost impassable for even a pack train beyond the transfer. Packers are asking from 8 to 10 cents a pound for packing freight from the transfer to Roosevelt. The H.-Y.-Climax shaft, which is down 265 feet, is to be used as the working shaft.

#### Owyhee County.

The Cumberland mill, near Silver City, is running one battery of stamps on ore from their mine. There are eleven men at work, but little can be done until the Sinker tunnel draws the water from the shafts and drifts. F. Jenkins is superintendent.

The Banner mines, west of Coffee gulch on the west side of Florida mountain, near Silver City, are to be developed by the newly organized Banner M. Co., in which L. S. Honstead, P. Steele and F. S. Herr, all of Silver City, are interested. The lead carbonate deposits on South mountain, near Silver City, are being worked by F. M. Clemmens of the Standard M. Co. of Denver, Colo.—W. Lacherity has purchased from Connors & Evans the John-Bill mining claim on War Eagle, near Silver City.—A. F. Stevens, manager of the Rich Gulch Co.'s mine on the south side of Jacob's gulch, Florida mountain, near Silver City, has men at work advancing the tunnel on the vein, which is reported to be making a good showing.

#### Shoshone County.

The Beartop M. Co.'s mill near Murray is completed. The capacity is 150 tons a day, but additional machinery is to be put in as soon as better transportation for the output is secured. It is driven by water power. The flume is 8000 feet long, and at the mill the water has a drop of 450 feet. Work in the mine has been started.

The Idaho-Nevada M. Co. have elected as president H. J. Rossi; secretary and business manager, W. J. Bracking; vice-president and superintendent of mines, O. R. Young. The company now has miners at work on its Wallace property.—The litigation between the Nine Mile M. Co. and Mary Kate Wylie of Murray has been settled out of court. Each party owned a half interest in the Topeka lode, 4 miles from Wallace, which the Nine Mile Co. considered the best in its group of claims, and as Mrs. Wylie would neither consent to sell nor work her interest in the property in conjunction with the company, the latter brought suit for a division of the property. It is the suit which has been compromised, Mrs. Wylie deeding her half interest to the company for a cash payment and 50,000 shares of the company's stock.—The Pittsburg Lead M. Co., which is operating the Black Cloud and California and the Panhandle groups on Nine Mile creek, has completed the purchase of the latter property, which it has had under bond. A. D. Marshall, formerly superintendent of the Standard mine at Mace, is in charge of the operations of the Pittsburg Co. The company has 120 men on its payroll and is planning to equip its mines and mill with electric power so that it may be able to work continuously without being hampered in the dry season by lack of water. The mill is making regular shipments of concentrates to the American Smelting & Refining Co.'s smelter at Pueblo, Colo.—The Wake-Up-Jim G. M. Co. has elected G. M. Ward president; J. A. Ward, vice-president; C. S. Cryslar, secretary-treasurer and general manager. The Wake-Up-Jim is at the head of Trail creek, near Wallace. Work will begin upon a 100-foot tunnel with eight-hour shifts. The ore is largely free milling and the sulphurets yield to treatment by cyanide. It is reported that a 10-stamp mill with cyanide plant will be placed upon the property.

The Stanley M. Co., which owns claims south of the Morning mill, near Mullan, is preparing to resume development work on the property.

Judge Beatty has refused the injunction asked for by a number of farmers on the Coeur d'Alene river against mining companies of Coeur d'Alene that tailings from mills were deposited on lands of plaintiffs at high tide, poisoning the grass and hay. The judge not only denies the injunction, but criticises the plaintiffs. Judge Beatty enters into the question of contradictory affidavits filed regarding the presence of poisonous substances in the waters of the river as asserted by chemists on either side, and concludes that the court would be unable to justify itself from these affidavits in issuing a restraining order. The court further says that the granting of such an injunction would shut down the mines and depopulate the district.

At the annual meeting of the Sister M. & M. Co., at Wallace, S. Markwell was elected president and treasurer, C. V. Genoway vice-president, C. W. Gossert secretary and J. E. Markwell manager. The management is planning to sink a 3-compartment shaft, the work of which has already been started.—There are 3 feet of ore disclosed in the recent strike in the Hercules mine, at Burke, in a drift run from No. 2 tunnel.

#### Washington County.

The Little El Frieda M. Co. is working on War Eagle mountain, near Warren. W. C. Colwell, the general manager, has started work at the mines and has ordered 1000 feet of track rails, ore car, hand-power drill and other supplies. He has also ordered a complete assaying outfit.

From Landore, in the Seven Devils district, it is reported that the Ladd Metals Co. is preparing to start mines and smelter. The smelter will be overhauled and reverberatory furnaces substituted. A large amount of fuel is being accumulated and men are being placed at work in the company's properties. The bins contain 2000 tons of ore ready for the smelter.

#### MISSOURI.

##### Jasper County.

The Joplin News-Herald says that the North Main Street M. Co.'s mill is shut down temporarily.—D. M. Sayres is sinking a shaft to open up a prospect on the O'Keefe land.—O'Connell & Co. are operating the Old Rollin mill, at Midway, working on tailings.—Thompson & Co. of Joplin have started up the Ringo mill on

the O'Keefe land.—The Last Chance M. Co. is preparing to resume operations on the O'Keefe land.—The Denver M. Co. has begun drilling on their 200-acre lease of Oakland.—The Jayhawk M. Co., operating on a lease on the Amazon land, has its shaft down 140 feet.—An 8-inch pump has been installed at the old Orchard mine, on the Cox land, by F. Malang and others.—The Lillie M. Co., operating on a 40-acre lease on the Amazon land, has started up its new mill.

#### MONTANA.

##### Beaverhead County.

J. C. S. Wells of New York has resumed work at the Polaris mine at Polaris, belonging to H. H. Armstead, Jr., et al., and is shipping silver-gold ore.

##### Broadwater County.

Work is being pushed on the Mason properties, the Park and New Era, near Hassell, under the direction of Mr. Atwater, who has been made managing engineer. The shafts and upper levels have been unwatered and connections are being made with the lower tunnel this week. During the past month tests have been made of the oxides, showing that a saving of over \$8 per ton can be made, and a cyanide plant is contemplated, in addition to the 100-ton concentrator. The concentrator will be started as soon as the lower and upper workings are connected so the ore can be taken to the mill at low cost.—R. A. Bell, owner of the East Pacific mine at Winston, has started work on a concentrator on the property, which will be ready to run by the 5th of July. With this mill he will work 20,000 tons of ore on the dumps with an equal amount of second-class ore left in the stopes. It is reported that D. P. Little will have charge of building a cyanide plant at this mine.

##### Cascade County.

Roehl Bros. of Neihart have started their new concentrator on ore from the London mine, upon which they have a lease.

##### Deer Lodge County.

The Gold Coin 30-stamp mill, 3 miles from the Cable Lease property, near Anaconda, is in operation on ore from its own mines, and it is understood that the operators of the mine are working on a large body of low-grade gold rock.—The Southern Cross property, 1 mile from the Cable, is being worked with forty men. The roads in that section have been bad for quite a while, and no ore has been shipped on this account, but there are 500 tons on the dump ready for shipment. The new cyanide mill is about ready to receive ore. The high-grade product of this property is to be treated elsewhere, but the lower grade will be run through the mill and cyanide plant.—A strike of high-grade gold ore is said to have been made on the Montana claim in that district, owned by J. Ducie of Anaconda and M. Gaffney.—A United States Geological Survey camp has been established near Anaconda to make surveys of the mining districts west of Anaconda. The work will be under the direction of H. L. Baldwin, Jr., of Washington, D. C.

##### Fergus County.

In sinking with a diamond drill to find ore on the Bullard claims at Kendall the St. Paul syndicate that acquired the property over two months ago has struck oil. When a depth of 400 feet had been attained oil gushed out before the hole could be plugged. The flow is said to have reached about twenty gallons a minute.

##### Jefferson County.

O. B. Whitford of Butte, who owns the State mine in the Bigfoot district, 12 miles southwest of Boulder, in the Whitetail range between Boulder and Whitehall, reports an excellent body of high-grade ore in the face of the 500-foot tunnel, which he and Mr. Lyon have been driving into the mountain.

##### Madison County.

A. Bradberry, of the Conray Placer M. Co., operating on the Ruby river in the Ruby mining district, reports that there are two dredgers at work, which are handling nearly 2000 cubic yards of gravel per day, and another machine of larger capacity is being put in.—The Revenue mill, near Norris, has resumed work after a short shutdown.

##### Silver Bow County.

(Special Correspondence).—The Amalgamated sub-companies of Montana have made their annual statements to the county assessor at Butte for the purpose of taxation on net earnings. The total output of ore for the year ending June 1, 1905, was 3,293,584 tons, and the gross yield \$33,749,397.16. Total cost of mining, \$10,949,811.85; paid out on freight, \$1,484,807.27; cost of reduction, \$8,626,381.82; cost of marketing, \$3,647,183.53; net earnings, \$8,692,243.52 against \$6,240,025.54 for the year ending June 1, 1904, an increase of \$2,452,217.98. The following figures showing tonnage of ore, gross and net proceeds will be interesting for comparison:

	Tons.	Gross.	Net.
Boston & Montana.....	1,138,307	\$14,634,923.46	\$5,855,620.07
Anaconda.....	1,473,644	13,787,315.07	2,259,693.73
Parrot.....	167,963	1,448,551.37	338,106.69
Trenton.....	150,295	817,421.35	70,110.23
Butte & Boston.....	250,433	1,932,837.12	178,712.81
Washoe.....	102,941	1,097,018.79	.....

Butte, June 12.

For the year ended June 1, 1905, the Amalgamated Copper Co. earned \$8,692,243.52—\$2,452,218.98 more than for the year ending June 1, 1904. The statement was filed with the assessor of Silver Bow county for taxation purposes as follows: Anaconda, \$1,259,875.91; Parrot, \$233,964.68; Trenton (Colorado), \$74,832.35; Butte & Boston, \$96,853.48; Boston & Montana, \$4,574,498.12. The total shipments of the Amalgamated smelters is placed at over 10,000 tons a day, 7000 of which is being sent to the Washoe smelter and 3500 to the Great Falls plant.

For January, February, March, April and May the Butte production was 139,555,250 pounds of copper. During May the Boston & Montana Co. averaged 196,000 pounds a day; the Anaconda, Parrot, Washoe, Trenton and Butte & Boston, 442,000 a day; United Copper, 130,000 pounds; Clark mines, 117,000, and North Butte, 35,000.—The Parrot mine of the Amalgamated Company, which was shut down during a part of May and April, is again working to near full capacity and is shipping about 500 tons of ore a day to the Washoe smelter.

While the mine was shut down more men were put to work in some of the other Amalgamated mines and the output increased so that the loss from the Parrot was offset and the production was not affected. The Rarus mine, of the United Copper, which was shut down for some time while repairs were being made on its shaft, is also working a full force again.—B. B. Thayer, assistant to President Rogers of the Amalgamated Company, has been in Butte inspecting the mines and smelters of the company in Montana.—The Reins Copper Co. has authorized the expenditure of \$10,000 a month for six months to develop the Combination mine. It is proposed to sink the shaft 500 feet deeper and enlarge it, and purchase a new hoisting plant and a pump large enough to handle the heavy inflow of water. No cross-cutting will be done until the shaft reaches a depth of 1200 feet, but a station will be cut at the end of each 100 feet.

#### NEVADA.

##### Esmeralda County.

Upon the completion of the line for the transmission of current from Bishop, Cal., to Goldfield, the Combination mine and mill will be equipped with electrical motive power. It is expected that the line will be completed by September 1 next, and it is probable that the various other big properties will also be operated by like power.

##### Lincoln County.

The Gold Bug claims, 12 miles from Caliente and 2 miles north of the Salt Lake Route, are being developed by Caliente people.—South of Caliente deposits of borax have been located by E. Keate and associates.—Geo. Fischer and M. Daly, owners of the Fire Fly claims northwest from Caliente, have bonded them for \$40,000 to Chea, McCornick & Weaver of Cincinnati.—The new cyanide mill on the Abe Lincoln, at Pioche, is in steady operation and making good recovery from the tailings. The concentrator is running on crude ore.

The Quartette mine at Searchlight has commenced regular shipments of ore taken from the lower levels in development work.—T. Gahagan will sink a shaft to water level on the Blackhawk group at Searchlight.—C. Kirkeby has secured the Battle Creek claim, near Searchlight.—The Searchlight mine of the Duplex Co. of Searchlight has been unwatered, the water being used in milling. A promising vein in the lower level is to be developed.—W. F. Smith, J. W. Daulton and G. J. Strodeloff, all of Los Angeles, will form a company to work the Ophir group, near Searchlight.—Manager B. Macready will start development work on the Santa Fe at Searchlight. A small force has been drifting both ways on the 100-foot level.—The Gold Coin Co., sinking on the Sazerac mine at Dupont, expect to reach the 200-foot level by July 1.—The stamps of the new O'Connor mill at Juniper Camp have commenced falling on ore from the Chiquita mine, 1 mile west of the camp.—The Pittsburg group, 1½ mile north of the Wall Street at Eldorado Canyon, has been sold by A. E. S. Price to A. M. Jones of Los Angeles and A. Taylor of Chicago. The deal was put through by J. Howe and he will have charge of shaft work on the claims.

#### NEW MEXICO.

##### Grant County.

The Alessandro Copper M. Co. intend to develop the Victoria and Gettysburg mines near Silver City. P. McQuaid will succeed L. P. Deming as manager. The shaft on the Gettysburg, now down 250 feet, is to be sunk to the 500-foot level; the tunnel on the Victoria, now 400 feet, is to be continued. The 50-ton concentrating plant will be completed.—The Beck mine at Stein's Pass is sacking its telluride ore in the mine without treatment. The lower grade ore is being milled. New tables are being put in and after this work is completed the mill will be worked day and night.—F. G. Burns has taken charge of the work on the Wildcat mine at Santa Rita.—The Nevada M. Co., operating at Santa Rita, has changed its name to the Hermosa Copper Co. J. W. Bihle is superintendent.

#### OREGON.

##### Baker County.

The Connor Creek mine, bonded by P. Basche of Baker City, is to have a new 10-stamp mill, which will be put up below the site of the old 35-stamp mill.

At Baker City, in the case of A. P. Watson vs. The Keystone-Belle & Gold Boy Con. G. M. Co., judgment has been rendered in favor of plaintiff, restoring to him title to the Keystone and Belle quartz claims, which were sold under contract to defendants several years ago. Watson alleged that the terms of the contract were never complied with and sued to have the deed to the claims canceled.—H. T. Hendryx has formed the Taber Fraction M. Co. to work the Taber Fraction mine at Bourne.

##### Grant County.

Manager C. J. Allen will sink another 100 feet on the Monumental mine, near Granite.

##### Josephine County.

A 10-stamp mill is to be put in at the Michigan mine at Michigan City, 1 mile from Murphy. The mill is to be 2600 feet from Applegate creek and 265 feet above it. The shaft has been sunk 120 feet and a drift run 70 feet from that level. Sinking is to be resumed for another 100 feet.—J. C. Mattison, manager of the Copper Eagle M. Co., on Peavine mountain, west of Galice, states that the tunnel is in 300 feet. If the ore holds its high values shipments will be made to the Tacoma smelter. The wagon road from Leland now reaches within 3 miles of the mine, and the work of extending it to the mine will be begun this month.—The Mount Reuben Mining Association will begin operations in the Mount Reuben district, near Grants Pass.—A. F. Hooper plans to put in a 5-stamp mill at the Mount Pitt mine on Jump-off-Joe creek, near Grants Pass. A. Howland has charge of work in the mine.

##### Lane County.

(Special Correspondence).—At the Crystal Con. property in Bohemia the new 5-stamp mill commenced grinding ore on the 10th. The concentrators are not working well and some changes will be made. It is said



that a new and rich ledge has been found on the Twin Rocks property, in Bohemia.  
Cottage Grove, June 13.

## SOUTH DAKOTA.

### Pennington County.

The Clara Bell M. Co. is about to transfer its control to Cleveland, O., people. F. Hebert, the original locator of the property, is to receive \$25,000 the latter part of this month, and will receive for the next two years 7% on \$200,000, and at the end of two years will receive \$100,000 in money. For this consideration he gives up the control of the company. Under the new management it will operate on an extensive scale and a much larger mill will be built. The steam hoist of the plant recently burned, but it has been replaced by Cleveland capital. The mine is located 5 miles southeast of Hill City.

## UTAH.

### Junib County.

The Gold Blossom mine in the North Tintic district, owned by American Fork parties, has closed down. R. E. Hunter of the Capital G. & S. M. Co. states that the shut-down was due entirely to the scarcity of water in that section, the transporting of which by improvised means was expensive. It is the intention to wait until fall, when there will be plenty of water. The company has 4000 tons of ore which is available for shipment. Retimbering the main shaft in the Lower Mammoth of Tintic has reached the 1400 level and sinking will be resumed.

### Salt Lake County.

The Rod Wing air compressor at Bingham has started up. Tunnel No. 3 has been run over 700 feet and has cut two veins, one 25 feet wide, which carries large bodies of milling ore. This will be treated at a mill which the company intends to build. Regular ore shipments, averaging a car a week, are being sent from the McCann raise. The Julian tunnel is in 400 feet. P. M. McCree is superintendent. The machinery at the Butler mine has been started. Connections have been made between the shaft and the Hart tunnel. Regarding Bingham mining conditions, the Bulletin says that in Bingham ores can be mined and milled, the concentrates smelted and the metal product marketed at a total cost of \$1.78 per ton, and a 10,000-ton mill can handle ores carrying but \$3 in values at a profit of \$12,500 daily. Ore carrying but 1% copper can be made to pay expenses, with copper at 10 cents per pound. The same conditions exist with reference to the smelting ores, which produce copper at a total cost of 5 cents per pound. H. Greene of the Bingham Con. Co. reports that the Dalton & Lark ore bodies at Bingham have improved with depth. The new channel opened up in the Lark lode off the main tunnel has been opened up on the strike for over 400 feet and exposed in the face of the east drift 5 feet of ore, which shows good values in lead. This ore is sent to the furnaces of the American S. & R. Co. A raise is being made to connect with the upper workings, but the heavy flow of water is rendering this work slow.

### Summit County.

(Special Correspondence).—The Kearns-Keith mill at Park City, above the Silver King, has a daily capacity of 150 tons. One shift is working at present. Development work is being pushed in the mine. J. T. Kessel is mill foreman. It is understood that the Kearns-Keith Co. intend putting up a large concentrating plant near Park City to handle ore from their various properties. The Ontario mine is cleaning out the drain tunnel, which had a cave-in recently. On account of the cave-in in the tunnel the water has raised to the 1200 level, and it is feared unless they get the tunnel in operation that the water problem in Park City district will be a serious matter. The shaft buildings of the Ontario, which were burned one year ago, have been replaced by new ones. Over the hill from the Ontario the Daly-West Co. is mining 500 tons per day and milling 400 tons. All the first-class ore comes from the upper levels, i. e., above the 1200 level. The 1200-foot level connects with the loading station. The first-class, or shipping ore, is dropped through chutes from the 900 to the 1200, where it is loaded for shipment. The concentrates from the mill are lowered at the shaft and loaded at the mouth of the tunnel in the same manner as the ore. The company are operating with 295 men. J. A. McCaskell is superintendent of the mine and F. W. Sherman mill superintendent. Down the gulch from the Daly-West, the American Flag mine is putting in a new hoisting plant and steel head frame.

Park City, June 12.

The Columbus M. Co. has called for bids to run a 400-foot tunnel at its property in the Elkhorn district, near Park City.

### Tooele County.

Work has been started at the Eureka mine in Dry canyon, near Ophir, under the direction of J. W. Cairns.

### Utah County.

It is reported that the Bazook M. Co. is to resume work near Bingham. A. Van Patten of Salt Lake City is manager.

## WASHINGTON.

### King County.

It is reported that a tin smelter will be built in Seattle, according to a statement made by J. E. Burton of Milwaukee, Wis., president of the United States Alaskan Tin Mining Co. C. B. Russell, in the Marion building, Seattle, has guaranteed the erection of the smelter, providing the Alaskan tin men will guarantee to send their concentrates there.

### Snohomish County.

President M. Mitchell of the Smuggler G. & C. M. Co. states that the main crosscut being driven on the company's property near Index is in 243 feet. Many veins have been cut. On the Sultan river a ditch is being opened across a bar, 4 miles from Sultan, to turn the course of the stream and thereby expose the bed of the river, which will be worked by placer miners. A contract will be let for driving the lower tunnel of the Crown Imperial mine, near Silverton, 75 feet. The tunnel is in 440 feet. The company has received a good re-

port on the property from C. F. Lee. J. Norman is interested in the property. The upper and lower sections of the surface tram at the Sydney mine at Monto Cristo have been connected with a chute 100 feet long and ore is being shipped to the Everett smelter.

### Stevens County.

At the Napoleon mine, near Colville, preparations are being made for steady operations. Ore hunkers have been built, also bunk house, boarding house, etc., and a wagon road is being built from the mine to the nearest railway point. To cross Kettle river the Orient ferry boat will be used temporarily. Ore will be shipped to Greenwood smelter.

## WYOMING.

### Wood County.

An important copper strike has been reported by J. B. Hassett, manager of the Charter Oak M. Co. in the Charter Oak mine, near Saratoga.

## FOREIGN.

### CANADA.

### BRITISH COLUMBIA.

#### Boundary District.

J. Sullivan of Eholt is sinking a prospect shaft on the Granite Mountain claim on Eholt creek. The ore body has been struck on the McKinley, in Franklin camp, at a depth of 100 feet in the long tunnel. W. Hanna and J. Johnson have completed their contract of a 200-foot tunnel on the Golconda in south Deadwood. Another contract of 200 feet has been let by the owners. Shipments from the Boundary mines for the week ending June 10 were: Granby mines to Granby smelter, 11,027 tons; Mother lode to British Columbia copper smelter, 3510; Mountain Rose to British Columbia copper smelter, 132; Oro Denoro to Granby smelter, 132; Emma to Nelson smelter, 132. Total for week, 14,943; for year to date, 410,292. Boundary smelters treated as follows: Granby smelter, 11,195; British Columbia copper smelter, 4040. Total for week, 15,235 tons; total for year to date, 420,274. The May production of the Boundary mines in tons was: Granby mines, 55,420; Mother lode, 13,600; Brooklyn, 7002; Rawhide, 2110; Mountain Rose, 485; Dominion C. Co., 410; Oro Denoro, 387; Emma, 278; Providence, 40; Skylark, 50; Last Chance, 207; miscellaneous, 75. Total, 80,044.

#### East Kootenay District.

Operations at the Sullivan mine on Sullivan hill, on Mark creek, near Fort Steele, have resumed with thirty men. The new compressor and boilers have been put in and twelve drills are in operation. Daily shipments of about 125 tons are made to the Marysville smelter, which is in active operation. It is treating sixty to seventy tons of ore and roasting 100 tons daily. The daily product of the smelter is 100 pounds of bullion. The Perry Creek Hydraulic M. Co. has two 6-inch giants in operation and are working two shifts. Manager R. R. Bruce of the Paradise mine, on Spring creek, near Pinehurst, has started work on No. 4 tunnel, which is in 615 feet. More men have been put to work on the Delphine, near Wilmer. All the ore brought down to the road last winter is now being shipped by steamer to Golden, thence by rail to the smelter. It is reported that the Ptarmigan mine is to resume operations.

## MEXICO.

### Chihuahua.

By November 1 active work will be commenced on a 200-ton addition to the smelting plant of the Encinillas, Mines, Ltd., at Santa Rosalia, according to C. O. Greenwell, who states that although the present plant is used in treating ores from the mines of the company, yet as soon as the pending enlargements have been made the plant will be a custom one.

J. J. Clague has taken charge of the operations on the San Martin silver mine at Urachic. The recent purchaser, J. J. Watterson, expects to leave soon for Denver, Colo., to arrange for the purchase of machinery for reduction works, the kind yet to be determined upon.

G. C. Carothers, W. S. Dillon, general manager of the American-Mexico M. & D. Co. of San Lorenzo, Mr. Ryden, superintendent of the same company, and J. G. Daley, all of Torreón, with W. O. Watson, have organized the Fifth of May M. Co., to operate the Cinco de Mayo properties in the Mapimi district. The property consists of ninety-six pertenencias of entirely new ground.

### Coahuila.

The Constancia M. Co., composed of Saltillo people, is shipping 4000 tons of ore from its properties in Sierra Mojada. It is operating two of its ten mines and has several properties leased to others. W. Hagemann is general manager.

The Continental Copper Co. propose to build a reduction plant at the Panuco mine, near Monclova. O. Wahrmond and M. Koehler of San Antonio, Tex., and S. D. Bridge of Monterey, Nuevo Leon, are interested.

### Durango.

Preparations are being made by J. A. Soram of Boston for the erection of a 250-ton concentrating plant at Guanacavi to work the ores from his Nueva Australia, Soto and other mines on the Soto vein, in the Guanacavi district. A matting furnace will be put in and the concentrates and high-grade ores will be converted into matte.

### Puebla.

The Cia. Minera de Mexico, Ltd., has started its new 150-ton chlorination and cyanide plant at Tatales. The company is said to have 80,000 tons of manganese ores, carrying gold, in sight.

### Guerrero.

(Special Correspondence).—S. L. Butler, president of the Pioneer Sampling Co. of Salt Lake City, Utah, has denounced with the name of Los Pozos ten pertenencias in the Los Pozos basin and is developing a contact vein between slate and porphyry. Near the hacienda of the Concepcion he has denounced and is working fifty pertenencias called the San Pabito. The Babylonía mine, near the Arroyo de la Naranjitos in the Los Pozos basin, is being worked under the management of Horacio Lopez. C. Castillo has denounced 150 pertenencias

running from the Los Pozos basin southwest to the Rio de Chata. The Carrizal mill will resume work on the ore in the bins. In the mine work has been suspended except in the main shaft. Near the Rancho La Mira 2000 pertenencias of iron ground have been denounced by the Pacific Steel Co.  
La Union, June 4.

### Sonora.

The Alsacia M. Co. is to resume operations at its property, 28 miles northeast of Cananea, in the Ajo mountains. A small hoist and milling plant will be added. C. F. Wren of Bisbee is general manager and J. Herman of Globe is consulting engineer.

In the Moctezuma district the reverberatory furnace recently put in by the Transvaal M. Co., near Campas, is running continuously and turning out matte. The ores treated are high grade, averaging 20% copper. The same company are now building a silver-lead furnace, which will be ready to blow in about July 1. At Alamos the Zambona D. & M. Co. are pushing work upon the Minas Nuevas group. W. S. Cranz and A. Yaeger of Nogales are at the mine in charge of work.

A mill with a daily capacity of 500 tons of ore is to be built by the Red Mountain M. Co. at the Cerro Colorado mines, in the Altar district. A pumping plant and pipe line will be built, to carry the water 6 miles to the mill. G. E. Earnshaw is general manager at the mine.

### Zacatecas.

R. G. Gemmel of Salt Lake City, Utah, has been making tests on the ore from the mine of the Santa Rosa de Mazapil M. Co., at Mazapil, with a view to putting in a mill to handle the second-class product. Ore from development work is being shipped to the smelters.

## Books Received.

The engineering profession usually welcomes the writings of one of their number as a distinct aid to the advance of engineering work. Prof. Frank Soule of the University of California has kindly written the accompanying review of Prof. John Lyle Harrington's compilation of "The Principal Professional Papers of Dr. J. A. L. Waddell." Dr. Waddell has received the honorary degrees of Doctor of Science from McGill University, Canada, and Doctor of Laws from the University of Missouri, as well as his professional C. E. from Rensselaer Polytechnic Institute. He is one of the best known engineers and professors of civil engineering in the United States. He is a member of the American Society of Civil Engineers, of the Rensselaer Society of Engineers, of La Societe des Ingenieurs Civils, of the Canadian Society of Civil Engineers, of the Japanese Engineering Society (Kogaku Kyukai), and other organizations. It is easy to be understood, therefore, that with his lifelong devotion to the teaching and practice of his profession, and his ripe experience, his professional papers and publications should command the interest and attention, not only of students and engineers, but of the general reading public. One of the most interesting papers in this book is entitled "Civil Engineering Education," and is accompanied by comments from Prof. Wm. H. Burr, head of the department of civil engineering in Columbia University, Prof. A. J. DuBois of Yale University, Prof. Geo. F. Swain of the Massachusetts Institute of Technology, Alfred P. Beller, C. E., G. Bouscaron, C. E., W. H. Booth and many others. The discussions by these eminent men, as recorded in this work, add greatly to the interest in the original papers drawing forth their remarks. Mr. Harrington has done a good work in collecting these scattered papers and giving them to the world in a form alike pleasing and instructive to the engineer and the general student in these lines. His introductory notes form the connecting links that make the book a continuous treatise on civil engineering, and while he does not hesitate at times to differ somewhat from Dr. Waddell's views on general questions—as, for instance, on the ideal education of the civil engineer—yet his sympathetic and intelligent handling of the material composing the work adds greatly to its value. The language is clear, simple and direct, free from technicalities and instructive as an example of business and professional English. It could hardly be otherwise, since the book contains examples of the writings of fully 100 engineers and professors of engineering. As the list of names contains those of many of the most prominent technists in America, and their discussion of Dr. Waddell's papers, it is perhaps the more remarkable that the book should be so free from language unintelligible to the ordinary reader. Dr. Waddell's paper on "Civil Engineering Education" is fully and freely discussed not only by the editor, Mr. Harrington, but by Profs. Burr, DuBois and others, who agree that the education of the civil engineer should be founded upon a broad and liberal culture. This and many other chapters are of general interest, bearing on broad and general questions; but the work is especially valuable to engineers, because it deals with many practical problems such as daily confront the man in the field, or the designer in his office; and also to the young engineer just starting out in his career, treating, as it does, in great detail, the various subjects discussed. Dr. Waddell emphasizes the fact that the science of the engineer consists in adapting means to an end in using the materials on the ground to the best possible advantage and with the least practical cost. Any engineer can build a bridge, lay a foundation, drain a swamp, provided all materials are furnished. The problem then becomes merely a matter of computation and cost. But engineering work is rarely conducted with ideal conditions, and the skill of the engineer is shown in overcoming natural difficulties, or in forcing them to become aids to his work. The papers in this volume were written by a man who came to his desk from his triumphs in the field. He tells us of real and difficult problems solved, of formidable obstacles overcome; and he gives abundant advice, practical in its nature, rather than simply theoretical. He lays much stress on the drainage of land, a subject on which too little has been written. The first chapter in the book entitled "Railroad Drainage," although writ-



ten in 1878, is as instructive to-day as when it was published—that is, shortly after Dr. Waddell had completed a term of service in the construction of that portion of the Canadian Pacific Railway lying northwest of Lake Superior. His various papers on engineering problems in Japan are due to the fact that Dr. Waddell was, for several years, Professor of Civil Engineering in the Imperial University of Tokio. They will be of interest to the general reader as well as to the engineer, since they show, incidentally, the engineering conditions in Japan twenty years ago. His advice to young Japanese engineers might well be impressed to-day on every class graduating in civil engineering from our home institutions. The papers following this, with the exception of one on the advisability of instructing engineering students in the history of the engineering profession, are more technical in character, and are illustrated with maps, charts and drawings bearing on specific engineering problems. The engineer will read with profit and interest the chapters on "Railway Bridge Designing," the "Compromise Standard System," "Safe Working Stresses," "Elevated Railroads," "Foundations" (relating to work done in the City of Mexico), and several others. The special attention of the reader is called to pages 29-61 (Railroading); 211-453 (Bridges); 589-779 (Elevated Railroads), with full discussions by eminent engineers; and 785 to the end of the work, embodying his addresses on engineering educations and also technical dissertations. The volume cannot fail to be instructive and interesting, both to students and practical engineers, and will certainly be a valuable addition to the library of each of these classes of readers. Published, 1905, by Virgil H. Hewes, 245 West 107th street, New York City.

## Trade Treatises.

Excavating and screening outfits are portrayed in a leaflet from the Jeffrey Mfg. Co. of Columbus, O.

The Jeffrey Mfg. Co. of Columbus, Ohio, sends an illustrated description of the Jeffrey swing hammer, crusher and pulverizer and of the Jeffrey roll crusher.

The current number of "The Valve World," published by the Crane Co., Chicago, Ill., is devoted almost exclusively to Lewis & Clarke Centennial Exposition, now in progress at Portland, Or.

The July issue of Air Power, a technical quarterly devoted to compressed air and its uses, published by the Rand Drill Co., contains an illustrated description of a displacement pump, written by Prof. E. G. Harris; a description of a recent installation of a compressed air mine haulage system, by A. A. Bowman, M. E.; "The Uses of Compressed Air in the Wood Working Shop," by W. R. Hulbert, M. E.; a description of the construction of the new Duluth aerial bridge; an article on the Philadelphia high pressure pumping plant; a practical article on "Air Compressor Foundations," by E. M. Mackie, M. E.; three new inventions, as follows—a new tunneling machine, a pneumatic stake driver (used by Barnum & Bailey) and a device for conveying hot rivets through a metal tube by compressed air.

## Commercial Paragraphs.

THE Compressed Air Machinery Co., 24-26 First St., San Francisco, Cal., are finishing a large compressor for the Murchie mine, Nevada City, Cal.

J. W. DUNTLEY, president Chicago Pneumatic Tool Co., has returned to Chicago, Ill., from Europe, where he purchased the factory and business of E. G. Eckstein, Berlin, Germany, and that of the Lencke Co., St. Petersburg, Russia.

THE S. H. Supply Co. of Denver, Colo., are furnishing a No. 54 Lidgerwood single-cylinder hoist, with necessary hoiler capacity, cable, ore buckets, etc., to the Lodi M. Co. at Austin, Nev. The Lidgerwood Mfg. Co. have placed their Western agency with this company and are making a special mine hoisting engine for this market.

A CONNECTION of the Ingersoll-Sergeant Co. and the Rand Drill Co. has been made through the incorporation of the Ingersoll-Rand Co. under the laws of New Jersey. The new company will have a capital stock of \$10,000,000 and will manufacture air compressors, mining and quarrying machinery and pneumatic tubes as well as drills.

## Obituary.

J. W. McCULLY, owning mines at Payette lake, and a pioneer of Weiser, Idaho, died there June 3, aged 71 years.

D. C. HAIG, a mining engineer and millwright, died June 7 at Hypollite, Nev. He was a native of New York and 56 years of age.

G. N. B. McLEAN, formerly superintendent Detroit C. M. Co., and interested in Morenci, Ariz., mines, died at Los Angeles, Cal., June 6, from accidental poisoning.

T. W. BOGGS, a pioneer mining man of Arizona, was killed June 7 by being thrown from a buggy near Arizona City. He owned valuable mines in the Big Bug district.

EDWIN WILLIAMS, the Challis assayer, and Western pioneer, died suddenly from heart trouble near the head of Darling creek, north of Challis, Idaho, May 24, aged 56 years.

## Latest Market Reports.

SAN FRANCISCO, June 16, 1905.  
METALS.

SILVER.—Per oz., Troy: London, 26½d (standard ounce, 925 fine); New York, har silver, 58½c, refined (1000 fine); San Francisco, 58½c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, \$15.00; Lake, 1 to 3 casks, \$15.00@15.25; Electrolytic, 1 to 3 casks, \$15.25; Casting, 1 to 3 casks, \$14.25@14.25. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £66 spot per ton.

The copper market shows a slight fall in prices from last week, but these minor changes are due wholly to the ordinary fluctuations in trade, and do not represent the industrial conditions as related to the production and consumption of copper.

Following are the figures of the German consumption of foreign copper for the months of January-April, 1905.

	1905.	1904.	1903.
Imports, tons.....	33,172	40,859	27,363
Exports, tons.....	4,413	2,651	8,833
Consumption, tons.....	27,759	38,208	23,427

Out of the above, 26,720 tons were imported from the United States.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: £13 long ton.

SPELTER.—New York, \$5.35; St. Louis, \$5.70; London, £24 long ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.20; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 34½c, 35@37½c. London, £137 17s 6d.

PLATINUM.—San Francisco, crude, \$18.50 per oz.; New York, ingot, \$19.50 per Troy oz. Platinum ware, 75@82c per gram.

QUICKSILVER.—New York, \$38.00@38.00, large lots; London, £7 7s 6d; San Francisco, local, \$37.00@37.50 per flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c. SOLDER.—Half-and-half, 100-lb. lots, 20.50c; San Francisco, Plumbers', 100-lb. lots, 17.25c.

ZINC.—Metallic, chemically pure, 50c; dust, 40c; 10c; sulphate, 10c.

NICKEL.—New York, 55@60c per lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99½ pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99½, small lots, 37c per lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburg. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburg.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$16.35@16.35; gray forge, \$16.00; San Francisco, bar, 3c per lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburg, \$23.00@23.00; open hearth billets, \$23.00@23.00; San Francisco, bar, 7c to 12c per lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 6½c; less than 500 lbs., per lb., 7c; in 25-lb. tin pails, 1c per lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price.

Dry Lead.—In hbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city per hhl. CEMENT.—Imported, \$2.15@2.65 per hhl.; California, carload lots, \$1.90 f. o. h. at works; small lots, \$2.20 per bbl. in sacks, 4 sacks to hhl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.50; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; lath, 4 feet, \$4.50@5.00; pickets, \$21.00; shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Wallend, \$7.50; Brymbo, \$7.50; Pennsylvania, hd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in hulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2\*, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c per set; 14 oz., 40s., 9c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c per lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 per 100 lbs.; hyposulphite of soda, 3@3½c per lb.; caustic soda, in drums, 3@3½c per lb.; Cal. s. soda, bbls., \$1.10@1.20 per 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron,

8c per lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c per lb.; nitric acid, carboys, 8c per lb.

OILS.—Linseed, hulled, hbl., 62c; cs., 67c; raw, hbl., 60c; cs., 65c; Lucol oil, hulled, hbl., 54c; cs., 59c; raw-hbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 18c; As-tral, 18c; Star, 18c; Extra Star, 21c; Eocene, 20c; Elaine, 26c; Water White, in hulk, 11½c; Mineral Seal iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Minera; Sperm, cs., 26½c; Deodorized Stove Gasoline, hulk, 15½c; do., cs., 22c; 86° Gasoline, hulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in hulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., hbl., 75c; cs., 80c; Neats-foot Oil, pure, hbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 63c; Bleached, do., 57c; Whale Oil, cs., 53@65c.

BORAX.—Concentrated, 6@7c per lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c per lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c per lb.

MOLYBDENUM.—Best, \$2.75 per lb.

CHROMIUM.—90% and over, 80c.

URANIUM.—Oxide, 80c.

MERCURY.—Bichloride, 80c.

TUNGSTEN.—Best, 80c.

PHOSPHORUS.—American, 70c.

SODIUM.—Metal, 60c.

BISMUTH.—Subnitrate, 80c.

SILVER.—Chloride, per oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, 7c; less than 500 lbs., 7½c.

MANGANESE.—Black oxide, 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads 1000, f. o. b., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skewback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, 1 ton 2000 lbs. in 125-lb. bags, double, and dry ground, f. o. b., factory, \$8.50.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

HORSE BLANKET.—No. 701,372. May 30, 1905. Reuben A. Seaders, San Francisco, Cal. The object of this invention is to provide a blanket which is cheap and easily constructed, and it only requires the cutting of the material from the piece into the desired lengths, which are then stitched together and the blanket thus completed. It consists in the formation of a blanket by a union of sections stitched together and folded so as to produce the desired shape without cutting the material except to cut it into the proper lengths for the purpose.

STONE SAW.—No. 791,157. May 30, 1905. Archibald H. MacNutt, San Francisco, Cal. This invention relates to improvements in blades which are designed for sawing granite, marble, stone, or other material where abrasives are employed. It consists in the construction of the saw in such a manner that the abrasive material used in conjunction therewith will be constantly fed beneath the edge of the saw to produce the greatest downward and the least lateral cutting consistent with good work. The device comprises an abrasive saw having openings made at intervals in its lower edge, said openings being divergent from the top downwardly and having their walls diagonal relative to the line of travel of the saw.

DREDGER BUCKET.—No. 791,700. June 6, 1905. John J. King, San Francisco, Cal. This invention relates to improvements in buckets which are designed for use upon dredgers. It consists in the formation of the tail or lower end of the bucket continuous and integral with the sides and without joint at the junction of these parts.

DINING TABLE OR COUNTER.—No. 791,708. June 6, 1905. Nicholas N. S. Matcovitch, Oakland, Cal. This invention relates to improvements in dining tables and counters for restaurants, hotels, eating stations and the like, especially in localities where it is very cold at certain seasons of the year. Its object is to provide suitable d h warming means in conjunction with a table or counter, so that plates, platters, side dishes, etc., containing viands which should be served hot may be maintained in heated condition indefinitely after being placed before the diner. The device comprises a lunch counter or table, of a revolvable center stand including a base, a pedestal supported thereon, and supports on the pedestal provided with locally heated areas.

POWER FRUIT PRESS.—No. 791,746. June 6, 1905. Harvey M. Barngrover, San Jose, Cal. This invention relates to an apparatus which is designed for the compressing of dried fruits into boxes or packages. It consists in the combination of mechanism whereby the boxes containing a given weight of fruit are advanced, placed beneath the press, and the mechanism automatically returned after the pressing of each box is complete.

SPRING DANCING FLOOR.—No. 791,792. June 6, 1905. Richard E. Jeffery, Grass Valley, Cal. The object of this invention is to provide an elastic floor for any purpose for which such floor may be required. Such floors are very desirable in halls where dancing takes place. This invention comprises an elastic floor, consisting of boards laid closely to form a surface, other boards laid transversely intermediate of and parallel with rigid supporting joists, and supports extend between the joists to which the second boards are secured.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JUNE 6, 1905.

791,746.—FRUIT PRESS.—H. M. Barngrover, San Jose, Cal.  
791,864.—RULE HOLDER.—W. O. Bell, Los Angeles, Cal.  
791,861.—DUST BRUSH.—H. T. Epperson, S. F.  
791,617.—OIL BURNER.—M. A. Fesler, Visalia, Cal.  
791,463.—MUSIC RACK.—O. G. Gordon, Eureka, Cal.  
791,623.—HOE.—A. Holmes, Milwaukie, Or.  
791,786.—BALCONY.—F. C. Hotchkiss, Los Angeles, Cal.  
791,910.—CAR STEP.—E. Howe, Everett, Wash.  
791,792.—DANCING FLOOR.—R. E. Jeffery, Grass Valley, Cal.  
791,700.—DREDGER BUCKET.—J. J. King, S. F.  
791,528.—SIPHOON BOTTLE.—D. Landau, S. F.  
791,706.—MANIFOLD BOOK.—A. Levison, S. F.  
791,708.—DINING TABLE.—N. S. Matcovitch, Oakland, Cal.  
791,933.—ANIMAL TRAP.—W. McEndree, Fullerton, Cal.  
791,642.—FREIGHT CAR.—J. A. McGhie, Everett, Wash.  
791,805.—FISHING REEL.—G. Michellish, Avalon, Cal.  
791,567.—BARREL CLEANER.—A. E. Moorhead, E. Market, Cal.  
791,731.—CONCRETE MOTOR.—F. J. Morgan, Nevada City, Cal.  
791,715.—DRAFT EQUALIZER.—I. N. Noyer, Pomeroy, Wash.  
791,721.—OIL BURNER.—J. Palmatary, Los Angeles, Cal.  
791,812.—OIL BURNER.—J. Palmatary, Los Angeles, Cal.  
791,814.—WRENCH.—W. M. Pitzer, S. F.  
791,496.—CREAM SEPARATOR.—A. Porten, Berkeley, Cal.  
791,650.—FRUIT PITZER.—K. T. Elbert, San Jose, Cal.  
791,577.—SUBMERSE ORE.—E. Riveroll, Los Angeles, Cal.  
791,528.—DRIER.—W. F. Robinson, Anacondes, Wash.  
791,502.—VEHICLE WHEEL.—A. H. Rochford, Point Reyes, Cal.  
791,651.—WRENCH.—J. Roemer, Santa Maria, Cal.  
791,517.—SMOKE CONSUMER.—S. M. Walker, Los Angeles, Cal.  
791,596.—ROTARY MOTOR.—O. E. Waxed, Oakland, Cal.  
791,970.—SASH HOLDER.—A. Wilkie, S. F.  
791,654.—PUMP.—E. J. Wilson, Southend, Wash.  
791,666.—PLUMBING.—J. M. Wishart, Pasadena, Cal.



# MINING AND SCIENTIFIC PRESS

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## An Important Mining Region.

One of the most important mining districts of the West is that about Park City, Utah. Of the several mines of that locality the Ontario is the best known. The history of this great mine is interesting.

The first mine in this part of Utah was the Miller mine at the head of American Fork canyon. Other noted mines of those early days were the Emma and Flagstaff at the head of Little Cottonwood canyon. While these mines were producing their millions in lead and silver, but scant attention was given the region about Park City. The location is near the summit of the Wasatch range, 25 miles southeast of Salt Lake City, and 3000 feet above it, the elevation above sea level being 7200 feet. Park City is on the east slope of the range, which is far less rugged than that on the west. The Wasatch is formed by the faulting and uplift of a great block of limestones, quartzites and other sedimentary rocks, which have been intruded by igneous rocks of various kinds. The west slope of the mountains is very steep, being the scarp of the uplift modified somewhat by subsequent erosion. The Park City district lies between the rugged bluffs that mark the crest of the main range and the rolling slopes and meadows of the eastern foothills. The altitude of this region results in rather short cool summers and autumns, with long



Buildings and Dumps, Ontario Mine, Park City, Utah. (See Page 407.)

cold winters, during which the snowfall is heavy, and the temperature averages low.



The Wabash Mine, Near the Ontario, Park City, Utah. (See Page 407.)



The Daly West Mine, Park City, Utah. (See Page 407.)

The accompanying illustrations give an excellent idea of midwinter in this part of the Wasatch, and also its appearance late in the spring, when the greater part of the snow has disappeared, but considerable still remains on the north slopes, where the drifts have been deep.

The Ontario mine was discovered in June, 1872. The outcrop was small, projecting but an inch or two, and was mostly covered by detritus. With a width of 18 inches at the surface it pinched to 8 inches in sinking 8 feet, which was not very encouraging for prospectors in that region, even though the ore assayed 100 to 400 ounces per ton. The prospect was sold within sixty days of its discovery to George Hearst and others for \$30,000 through Marcus Daly, who negotiated the transaction.

An active campaign of development was at once started and the mine improved, but there were times in its history when the future looked anything but promising. Great floods of water was one of the disadvantages, and it is said that at one period an unavailing effort was made to sell the property for about \$300,000. The mine was opened through tunnels driven from the neighboring gulch, and eventually three shafts were sunk, the deepest being over 2000 feet. One of the great features of mining at the Ontario was the drain tunnels, the longest of which is several thousand feet. The mine has produced silver which sold for more than \$35,000,000.

The active development of the Ontario stimulated prospecting throughout the district, and the Ontario fissure was traced westward into the Daly, Daly-West and Daly-Judge mines, all of which have developed into valuable properties. Within eight years after the discovery of the Ontario over 1200 claims were located in the Uinta district, where these mines are situated.

The fall in the market value of silver seriously affected the mines of the district for a time, but changes and improvements were made in mining and metallurgical methods, and although silver continued to fall still lower, the price of lead advanced somewhat, and the mines were again able to operate at a profit. The ores contain chiefly silver, lead, copper and gold, their importance being indicated by the relative position of the metals named.

There are ten shafts in the district varying in depth from 1000 to 2000 feet, the deepest starting at a lower point than any of the others. There are four drainage and transportation tunnels, the longest over 3 miles. Mining and metallurgical operations are thoroughly modern. Some of the metallurgical operations have been previously described herein, notably the concentration of slimes by F. W. Sherman.



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J. F. HALLORAN.....Publisher

SAN FRANCISCO, JUNE 24, 1905.

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THE index to the volume ending with to-day's issue will be found on pages 416, 417, 418, 419 and 420, and is an exponent of the wealth and variety of this journal's contents. In response to numerous requests, an innovation is made in indexing "Concentrates," a separate section being devoted thereto. The contents of this journal for the six months ending to-day comprise all that is of most present importance in the great mining industry of the country, and, like its eighty-nine predecessors, exemplifies "the present state of the art."

THE theory of the formation of the diamond is again being given considerable attention by various scientific writers. This question has been the subject of careful investigation for many years, and at various times prominent writers on scientific subjects have expressed the opinion that the mystery of the formation of the diamond had been solved, and as often other observers, whose opinions are entitled to as much consideration, have shown that these conclusions were based on unsubstantial premises. Gardner F. Williams, whose opportunities for intelligent observation in this direction have been superior to all others, candidly confesses he is unable to account for the remarkable occurrence of diamonds in the volcanic pipes of South Africa.

SOME chemists and practical operators who are making a specialty of the cyanide process have suggested that cyanide operators generally are "getting in a rut," and that greater things and further improvements are possibilities of the future. Doubtless this optimistic prophecy is not without foundation, and the cyaniding fraternity will gladly welcome any improvement or modification of the process which will cheapen the operation and make a higher extraction and recovery possible. It seems that much remains to be desired in the precipitation of the dissolved gold—something superior to the zinc precipitation with its various modifications. New facts concerning cyanide operation are being learned with surprising frequency, and the prophets of better methods and more satisfactory returns predict not without reason.

## Measure of Efficiency in Mine Management.

A comparison of mining costs is not always just, for the reason that conditions under which these costs were made may be so totally different as to afford no fair means of comparison. Working costs at a large mine which has been in operation for years, and where the organization has reached a high degree of excellence, may seem astonishingly low to stockholders in a small mine in the development stage where capital is limited. The power plant is small and consequently more expensive per unit of power than that at the large well equipped mine. Water may make in the mine more rapidly than the machinery at hand can readily control. This means increased expense per unit of power. In almost every department expenses for any operation are higher than at the large plant, and those interested in mining should bear this in mind. The fault is not always in the superintendent, but in the home office, which is either unwilling or unable to supply the necessary means to properly equip the mine and to permit the conduct of mining operations on a scale which will reduce the expense account as related to the amount of work accomplished. It is obviously more expensive to work only two or three men per shift underground with a surface crew of four men than to put eight or ten men in the mine while utilizing the same surface crew. The limited means available for the opening of some mines has brought the ingenuity of the superintendents of these mines into active play, and the various devices improvised and applied to the work in hand is instructive and sometimes amusing. At some mines one man at the surface performs all the labor—is engineer, blacksmith, timberman, roustabout, fireman, and sometimes also general manager. This can only be accomplished usually by the employment of devices, more or less unique, which are automatic in their operation and thus take the places of men. While miners below are drilling, the topman becomes timber framer or blacksmith, answers bell calls, looks over his hoisting machinery and gives attention to the general business connected with the mine. When the shots are fired and the miners begin to muck he turns engineer, and hoists the bucket or skips, which dump automatically into a bin or car, lowers the vehicle into the mine, and then goes out and trams the rock to the dump, returning to the engine ready for the next load. His bookkeeping and letter writing are done at night, and he is the busiest man about the establishment. Such a man usually gets from \$100 to \$150 per month. His ingenuity and industry monthly saves the company the wages of an engineer, carpenter and topman, but as a rule it is considered that he has done no more than he should, and on the whole is an extravagant manager, because in working thus from "hand to mouth" his costs are relatively higher than those at a large and well-equipped mine with a staff of engineers and assistants, where money is available for every necessity, and costs can be reduced to a minimum by reason of the large scale of operations.

## Errors in Lode Location.

A Colorado court recently decided that a mining location was invalid because the surveyor employed to survey the claim—presumably for the purpose of making application for patent—had "tied" the claim corners to a rock and tree. The court declared that it was the duty of the locator to tie to a corner of the Government land survey. Such arbitrary decisions from lower courts need not create any alarm, for the Supreme Court of the United States would not invalidate a claim made in good faith, simply because a careless surveyor failed to tie the corners of the location to the land survey. The statute requires that the boundaries be plainly marked, so they may be readily traced, and if a stake at each corner is not visible from the farther corner, other stakes must be placed in intermediate positions. The Federal statute requires (Sec. 2327): "That the description of vein or lode claims upon the surveyed lands shall designate the location of the claim with reference to the lines of the public survey," etc. There has been within the past two years much talk and some litigation over the position of mining claims and the Supreme Court has decided that the monu-

ments control; and if the deputy mineral surveyor made an error in direction or distance in referring the claim to the public land survey, such error does not invalidate the location, and it seems inconceivable that the failure of the surveyor to so connect the claim corners with the land survey—substituting rocks and trees—will not be viewed in the same light by the Supreme Court.

## Sinking Fund for Mines.

Where large improvements are to be made on a mining property, the means to make them must be forthcoming from some source. In many cases this is accomplished by the levy of assessments on the stock of the company; in others it is derived directly from the net output of the mine. The latter is by all means the most satisfactory, and every mine which possesses the elements of commercial success should be so managed that a certain percentage of the net yield may be placed monthly in a sinking fund to be invested in securities, readily negotiable without loss, at any time the money may be required to replace or to extend the plant. When a mine's business is handled in this manner it is approaching the nearest to a legitimate business enterprise; but when these necessities of the concern are made a means of depressing stock values for the purpose of speculation, the proposition presents a somewhat different aspect. The prompt distribution of every dollar of net earnings in the form of dividends may be gratifying for the time being to the stockholders, and the market price of stock is usually favorably influenced to a considerable degree by such disbursements; but when the dividends are reduced, stopped altogether, or, still worse, an assessment is levied to meet the requirements of extensions in plant and the enlargement of the scope of operations, whether such increase will result in ultimate greater economy of production or not, the effect on the stock of the corporation is depressing. There are instances where this short-sighted policy of the management has "method in its madness," which is to be deplored, for the reason that it is these uncertainties in results which tend to place mining among the "hazardous risks" in the commercial world, when the more conservative handling of the mine's business would result in giving to its stock that firmness which characterizes a certain line of substantial industrials.

WHILE innovations, more or less startling, are constantly being introduced into the business of mining and of metallurgy, there are other lines in which equally great, if not more startling, changes are being made and contemplated. These are mostly in engineering and in electricity, or the application of electrical energy to the former. Particularly is this noticeable in transportation. On railways a speed of 60 miles per hour for comparatively short distances, and of 30 miles an hour for long distances, has long been an accomplished fact. Recently an Eastern railway put on an express train which ran from New York to Chicago in 16 hours, or a speed of about 60 miles per hour for nearly 1000 miles, with a much higher speed over a part of the distance—this with steam equipment. Now it is proposed to apply electricity to the transportation problem between these cities, with the assurance that there will be no ultimate difficulty in making the distance in eleven hours, or at the rate of 90 miles an hour. To say that this will not eventually be accomplished would be an unwise assertion.

THE Charters Towers district of Queensland, Australia, produced in 1904 over \$6,000,000 in gold, besides values in other metals. The district is in a semi-desert, where the natural difficulties are abundant and where, for the most part, methods of mining, transportation and reduction are somewhat primitive to say the least, all of which speaks well for the natural resources of the district. This is not an unusual condition. There are many places in the Western United States where the richness of the ore at the surface has in the past and still admits of the most crude methods and an extravagance of management which is unheard of in older well organized mining regions. Notwithstanding the richness of these mines, comparatively small profits are made from their operation owing to this primitive handling.



## CONCENTRATES.

ORDINARILY boilers require about 1 cubic foot of feed water per hour for each nominal horse power.

ORE to be crushed dry must first be subjected to a drying process, which will drive out the moisture, otherwise the ore will have a tendency to pack.

MUCH telluride ore on roasting shows gold. Some auriferous arsenical ores will do the same thing. Arsenical ore cannot be readily amalgamated.

CHINA produces and exports considerable crude antimony and antimony ore. The quicksilver produced in China does not fully supply the local demand.

IRON sulphide is found in greater or less amount in nearly all coal, also in conglomerates and in gravels which have never been consolidated into solid rock.

ANY work done on an unpatented mining claim, whether by day's pay, contract or otherwise, so long as it is performed at the instance of the owner, is chargeable to assessment work.

FROM twenty to thirty gallons of water are required to condense one gallon of water from steam in condensing engines, or approximately 1 to 1½ gallons per minute per indicated horse power.

THE mil is a unit of length in measuring the diameter of a wire, being 0.001 of an inch. It is used in electricity. A circular mil equals the square of the diameter in mills or thousandths of an inch.

REVERBERATORY FURNACES vary greatly in size, from 7x10 feet hearth area to 17x70. The cost depends upon size, material used and its cost, method of construction and price of labor.

ALTHOUGH mining has been carried on for centuries in England and on the continent of Europe, there are many of these old districts where old-time and comparatively primitive methods are still in vogue.

WHEN heated before the blowpipe on charcoal, bismuth and its ores give a dark orange-yellow coating which fades to lemon yellow on cooling—the yellow coating being usually surrounded by a white ring.

JOSEPHINITE is a natural alloy of platinum and nickel, the chief characteristic of which is its marked magnetism. It occurs in grains in the sands of placer deposits in Josephine county, southern Oregon.

UNDOUBTEDLY losses occur in cupellation in the fire assay, but where good cupels are employed and the work done by an experienced operator, the losses by volatilization and absorption are usually so small as to be negligible.

MOLYBDENITE and some varieties of specular iron ore look much alike to the unpracticed eye. They may be distinguished by the superior hardness of the iron ore and its red-brown streak. The streak of molybdenite is black and metallic.

ALASKITE is a silicified aplite, or micaless granite. It is not known as associated with laccoliths. The rocks noted in connection with laccoliths in Arizona, Colorado, Utah, South Dakota and Nevada are usually quartz-porphry, rhyolite, andesite, etc.

TO RENDER a compressed air plant efficient, the pipes and receivers must be of liberal size and inspected frequently in search of leaks, which, when occurring, must be stopped. Flange joints for at least every other section of pipe are advisable in air and water pipe lines.

THE locomotive or fire-box boiler is a convenient but wasteful method of creating power. The return-flue boiler is more expensive in first cost, but is also more economical in operation. The fire-box boiler can be improved by placing a damper in the stack and by utilizing a water heater.

BORAX MINERALS give a greenish color to the blow-pipe flame. Colemanite (calcium borate) exfoliates and fuses imperfectly when heated before the blowpipe. The crystals are monoclinic, but otherwise resemble some calcite. It contains boron trioxide, 50.9; lime, 27.2; water, 21.9.

POCKETS of gold occurring erratically in a vein or in the wall rocks near it are not a proper measure of the value of the ore per ton. Usually in mines producing pockets the vein material is too low grade to mill. There are numerous fortunate exceptions to this condition, for some well known milling mines have produced substantial pockets of gold.

ONE of the most important details requiring attention in the operation of canvas plants for the concentration of slimes is the even distribution of the material at the

head of the table, and another is to see that the tables are not overloaded. Either of these matters, if not properly attended to, will result in inferior work, producing dirty concentrates.

A RULE for calculating the size of pulleys is as follows:  

$$d = \frac{D N}{n}$$

$$n = \frac{D N}{d}$$
 D=diameter of driving pulley; d=diameter of driven pulley; N=revolutions per minute of the driver. n=revolutions per minute of the driven pulley.

AIR COMPRESSORS run by electric power are not uncommon about mines. The air is employed in drilling, running hoists, both above and below ground, and where the receivers are large and the pressure high—100 pounds per square inch—an installation of this character possesses some advantages when applied to hoisting. If the power is suddenly shut off, the air plant has usually sufficient expansive power in reserve to bring the skip to the surface.

THE discovery of tin ore (cassiterite) at Tinton, Lawrence county, South Dakota, is not a new event in mining. Tin was discovered there in 1880, and considerable exploratory work was done during the '80s in the development of the numerous prospects, but it is only within the past year that an effort has been made to reduce the ores at the mines. For this purpose the experimental mill at Tinton was built, and is said to successfully handle the ore.

THE New York Subway starts at the lower end of Manhattan island and runs northerly to 167th street, at the upper end of the island. A branch runs easterly from 103rd street to Westchester, passing beneath Harlem river. It cost \$35,000,000. Its greatest depth is at Fort George. There are elevators for all stations more than 30 feet below the street level. The total length is 21 miles; the height of the subway is 13 feet. Express trains run on this line at 40 miles per hour. The work was commenced March 26, 1900.

THE curvature of the earth is generally calculated at 8 inches for a mile, or, more accurately, .667 foot in 1 mile. This increases as the square of the distance, being four times 8 inches for 2 miles, and nine times 8 inches for 3 miles, etc. This is slightly diminished by the refraction of the atmosphere, which has a tendency to make the object appear higher than it really is, but varies with temperature. Although the discrepancy in level of an object a mile distant is but .572 foot, allowing for curvature and refraction, for 100 miles it is 5717 feet.

THE placers of the Black Hills are derived almost wholly from veins occurring in rocks of Archæan time, the notable exceptions being those resulting from disintegration of gold-bearing conglomerates of the Cambrian period, which originally derived its gold from the Archæan, and the gold derived from certain ore deposits in the Cambrian formation and veins occurring in eruptive rocks which were intruded into the sedimentaries probably as late as the latter part of the Cretaceous. The gold in Two Bit gulch is an illustration of the latter occurrence, and that in Blacktail the former.

AN economical means of hauling timbers from the level up into a raise or stope is sometimes employed in the form of two sheave wheels securely fixed at the top of the raise, two being employed to get the necessary distance between the ropes. An empty bucket is attached and hauled up into the stope. The timber to be raised is then attached to the opposite end of the rope and the bucket filled with ore or with waste and, acting as a counterbalance, the timber is raised to the desired point with a minimum of power. Where large amounts of timber are to be raised, it is advisable to put in a small air or electric hoist, though a still better plan is to put the raise through to the level above and send the timbers down rather than to raise them to where needed.

THE forces which tend to disrupt materials are of several kinds. These are termed stresses. A tensile stress is that force which has a tendency to pull the material (as a stick of timber) apart; compressive stress is the force tending to crush it by pressure upon the ends, as the cap crushing the top of a post; transverse stress is pressure upon the sides, as exhibited in the weight of heavy ground on the cap, which has a tendency to break it in two; torsional stress twists it, as may sometimes be seen when drift sets begin to ride, and shearing stress has a tendency to make one portion of it slide over another, causing splitting and collapse of the support. All of these forces can frequently be observed operating in timbers placed in mines.

THE diameter of the suction pipe of a pump should be such that the velocity of the column of water demanded by the speed of the pump can be easily maintained by the atmospheric pressure, plus any available head on the suction pipe over and above the resistance due to valves and pipes. The suction hose for pumps should be as short as convenient and considerably larger than the discharge column of the pump. The suction hose is wound with steel wire to prevent collapse due to atmospheric pressure, and it also serves in a measure to protect the pipe from damage due to contact with the rocks. The hose should be further protected by winding it with

½ inch to ¾ inch rope. This prevents the rocks in a shaft from cutting the hose, which will quickly happen should the pipe come in contact with the rocks when the pump is in operation.

IN the pulverization of ores it is generally desirable to have the material crushed pass out through a screen as soon as the particles are reduced sufficiently in size to escape, but there are certain ores where this practice would be detrimental to the best results in amalgamating. An ore carrying a large percentage of pyrite or other sulphide mineral, and that in which the gold does not quickly unite with the quicksilver, gives better results if crushed in a mortar having high discharge, and therefore retarding the escape of the pulp from the mortar. This gives the particles of gold an opportunity to amalgamate and settle in the bottom of the mortar or to become attached to the plates inside the mortar, or, if escaping, to adhere to the outside plates. Experience teaches that it is advisable to save gold as early as possible in each stage of the process.

A SLIGHT change of angle in a shaft need not preclude the use of a Cornish pump, nor for that matter in a shaft having sharp changes of angle. In the former case the rod is joined by strong links or side bars, and the ends of the rods are provided with rollers which carry the stress and weight at that point, the link gives the rod a small amount of flexibility and the device enables the pump to be operated without jar and with little "lost motion." Where the change of angle in the shaft is considerable the direction of motion of the two parts of the pump rod is changed by connecting the two ends by "bell cranks," or "bobs"—that is, triangular devices which admit of many different arrangements, whereby the line of motion is changeable from horizontal to vertical or from any given angle to another. Some of these arrangements show no little ingenuity on the part of the builders.

IN the Plattner or vat chlorination process the advantage lies in requiring no motive power. In the barrel process power is necessary, and this would make the latter process the more expensive if it were not for the largely increased capacity of the plant, due to saving of time. The ore is charged in a lead-lined barrel, together with chloride of lime and sulphuric acid and water. The barrel is closed and then revolved for several hours, when the charge is withdrawn, the liquor being drawn through a filter within the barrel. Sulphur dioxide is forced through the gold-bearing solution, followed by hydrogen sulphide, which precipitates the gold. In charging the barrel the water is first run in, and then the necessary amount of sulphuric acid. After this the roasted, pulverized ore is charged and on top of this the bleaching powder, which by this means is for a few minutes kept away from the acid which will decompose it, liberating the chlorine. The workmen are thus given an opportunity to close the barrel without inhaling the noxious fumes of the gas. If desired, the gold may be precipitated by the use of a solution of iron sulphate, but this requires so long a time that the sulphur dioxide and hydrogen sulphide are most generally employed. These latter may be employed in the vat process, as well as in the more modern barrel process. The only barrel chlorination plant ever installed in California was that at the Mayflower mine (now a part of the Fremont Con.), near Amador City. It was run only a short time.

THE measurement of broken quartz ore in a bin may be made on the basis of 20 cubic feet per ton. The capacity of ore bins, as usually stated, is based on the measurements of the bin, but the bin will not hold this amount unless level full, which it seldom or never is, unless the top be leveled off by shoveling. Thus, a bin of the usual form—that is, vertical front and sides, with back inclined at 35° and being 30 feet long, 14 feet deep and about 20 feet wide at the top—would actually contain, if level full, 4200 cubic feet of quartz, or 210 tons of ore; but, as the ore falling through the grizzlies and from the jaws of the breaker seldom fill the bin completely, the amount in the bin rarely exceeds 180 tons. The breaker should be set as near the front or vertical side as possible, as this will admit of filling the bin with ore to a greater height than if placed near the upper end of the sloping floor. If the floor be flat, a bin of the dimensions above given will hold, when level full, 420 tons, but there is no advantage in a flat bin, except storage capacity, and when the ore runs down through the chute door until the slope has reached the "angle of convenience," it will no longer run and shoveling must be resorted to at an expense of at least 15 cents per ton of ore. There is little, if any, advantage in having a narrow section of the bottom of the bin flat along the vertical side, for it only retards the free running of the ore when the supply gets low; and if shovellers have to be put into the bins, they work at a great disadvantage on the narrow flat surface, as they have not sufficient room for free movement, which is important in shoveling. The better plan is to put the breaker at the mine outside the mill and deliver the ore to the mill bins in cars entering the end of the building passing over the bins in the direction of their length. By this means ore can be distributed more evenly—coarse and fine—and the bins filled more completely than where the breaker is over the bin. Storage capacity should be provided outside the mill in bins built at the mine, and nothing but unfortunate topographical situation should induce a mill builder to put the breakers in the mill.



## Discovery and Development of the Homestake Mines of South Dakota.

NUMBER II.

Written for the MINING AND SCIENTIFIC PRESS.

These thoroughly modern methods of ore handling are in strong contrast with the practice of early days, when the ore was hauled in wagons, often through mud up to the axles. Other changes from old-time methods are fully as radical as those above mentioned.

The somewhat primitive methods of milling the ore were improved from time to time. The raw copper plates, which for years had been depended upon to amalgamate the gold in the ores, were reinforced by the addition of silvered copper plates. In the earlier days the ore from the surface and superficial workings was remarkably free, and a high percentage of the values was saved in the battery and on the outside raw copper plates. A great deal of work was put on these plates, and a new plate was never considered in good condition to do successful amalgamation until it had been worked upon every day for at least a month. The plates were rubbed and scoured and given every care to put them in condition. As little gold as possible was removed, and the thought of employing a steel chisel in dressing plates or cleaning up was unheard of.

So free milling was the ore in those days that a check was kept on the run of ore by the simple expedient of crushing samples of two pounds weight, taken by the shift bosses in the various parts of the mine, and panning the pulp in a tub. The sampling room was equipped with two large cast-iron mortars. Over one was arranged a pestle suspended from a "spring pole." In this mortar the weighed sample was placed after drying on a large oven provided with a sheet of boiler plate for a top. The ore was broken down to the size of hazel nuts and transferred to the second mortar, over which was fixed an old machine drill mounted on a timber frame. In place of a drill, a stamp head, made by "upsetting" a bar of steel, was attached to the drill chuck. When the steam was turned on this improvised steam stamp quickly pulverized the ore fine enough to pass a 30-screen, in which condition it was panned in a tank situated at one side of the room. So familiar did the sampler become with this method of testing the ores that his judgment was surprisingly accurate, and he could forecast and regulate the bullion output by this method. In doing this, of course much depended upon the sampling as done in the mine, but the results showed that the sampling was representative of the existing conditions.

The silvered copper plates were added as previously stated. The new plates below the first old line of apron plates were made wider than the latter, to reduce the pulp flow to a thinner sheet. This worked so well that later a third row of plates was put in, which were given a still greater width, for the same purpose as before, and with equally gratifying results. As these two additional rows of plates had demonstrated their usefulness, but as the tailings still carried values, a fourth row was added and again the wisdom of this policy was made apparent by an increased saving. The upper row of plates was 4 feet wide—the original width of all the old plates. Each row added below was wider than the last, until the fourth row was reached, which was 6 feet wide. Mercury traps were early employed and were still in use, but although the saving of values was high and resulted in profit, as the mine workings increased in depth the percentage of sulphides in the ore increased, and the free-milling gold became proportionally less. The ore is all low grade, as compared with most other mines, running about \$4 per ton. The ore from the surface workings almost universally averaged better than this, but below the values decreased somewhat, until a normal condition was reached. In the lower levels of the mine the ore runs from \$3 to \$5 per ton. No oxidized ore of consequence is found below the 400-foot level of the Homestake mine and in most of the mines of the group it does not extend below the 200-foot level.

The increasing loss of gold in tailings came to be looked upon with much concern, and it was finally decided by T. J. Grier, the superintendent, to introduce the cyanide process in an experimental way, in an endeavor to ascertain what could be done to stop the heavy loss—about one-third of the value of the ore. C. W. Merrill was engaged to make these tests. The result was that to-day the Homestake Co. has two of the largest cyanide plants in the world—one located on Gold Run below Lead, treating all the ore from the mills at Lead, and another plant near the junction of Deadwood and Blacktail gulches, which treats the material from the mills at Terraville and on the north end of the property. These two plants have a combined capacity of treating over 2000 tons of tailings daily. Although the cyanide process has done much in improving the metallurgy of Homestake ores, it has been the result of long-continued and intelligently directed experiment, and the process is still in the development stage, for changes are not infrequently made in plant or

methods, and Mr. Merrill has been devoting much attention to the treatment of slimes with much success, and it is expected before these experiments are concluded that the tailings from the Homestake cyanide plants will be practically worthless.

One of the most important of the problems presented by the operation of mines on so large a scale was the development of sufficient water to make these extensive metallurgical operations possible. The watershed tributary to the Homestake mines, at Lead and at Terraville, does not cover over 2 square miles, and the amount of water available within that area is barely sufficient for a 20-stamp mill. At Central City, Deadwood gulch drains an area of approximately 12 square miles, but the amount of water flowing here is also inadequate, except in times of flood. In the early history of the property the need of water soon became apparent, and as previously stated, water was brought to Lead from several streams at the south ward, the most distant being nearly 20 miles away in a direct line. At one time it was seriously contemplated moving the mills to some of the larger streams on the prairie, north of the Black Hills, where a large and never-failing supply of water would be available, but it was decided to first further develop the water of the region south of the mines, which was done with only partially satisfactory results.

One of the most valuable water privileges in the northern Black Hills came into possession of the Homestake Co. when it bought the property of the Father De Smet Co. This company early secured a water right on Upper Spearfish creek, and in 1878 built miles of ditch, flume and pipe line, with the intention of conveying the water to Central City for use at the De Smet mill, and in this connection at least two long tunnels were driven through hard eruptive rocks about 10 miles west of Lead, near Carbonate. These tunnels are each about 1500 feet long and cost many thousands of dollars. The project was never completed by the De Smet Co., for the ditch and flume were abandoned after about \$400,000 had been expended upon them. Although the Homestake Co. was in control of this property as early as 1880, nothing was done with the Spearfish water right until about five years ago. The repeated enlargement of the several mills and the consequent demand for more water determined the Homestake management to develop and utilize the water of Spearfish creek. The installation was made, and now water is conveyed from Upper Spearfish to Lead. In this plant the water is carried 9 miles through a 28-inch vitrified pipe to a station equipped with both steam and electrical machinery. From this station the water is pumped to a reservoir 400 feet above the station, at the rate of 4500 gallons per minute. From this reservoir the water flows by gravity through 4 miles of vitrified pipe to the head of Whitewood creek. From this point the stream flows in the bed of the creek for 4 miles, when it is taken out and carried by flume to Lead. This plant cost about \$1,000,000, and is one of the most expensive hydraulic installations for private enterprise in the United States.

As illustrating the value placed on any available water supply in the early days, it is related of Samuel McMasters, the first superintendent of Homestake, and the man who laid the foundation upon which this huge enterprise rests, that he one day took a horseback ride up a neighboring gulch in the Bald mountain region about 4 miles from Lead. Here he saw two prospectors working in a tunnel from which poured a good-sized stream of water—a sluice head, as the miners called it. He reined up and inquired of one of the miners how he was getting on, and on being assured that the prospect looked fine asked permission to inspect it. Pleased at an opportunity to show their claim to a man representing such substantial interests, they gladly assented. After spending some time in the wet tunnel, ostensibly examining a small seam of ore, but in reality sizing up the flow of water and character of the ground from which it came, he returned to the outside and remarked: "I suppose you boys will sell this prospect. What will you take?" One of the partners suggested that \$10,000 was about right. "Too much for such a small prospect," said McMasters. "It may all peter out in a few feet. We would have to spend a lot of money to develop it, take all the risk and perhaps get nothing. Now I'll give you \$6000 for this tunnel—and \$60 a foot is pretty good pay for drifting in this ground."

The miners considered a minute and said: "Well, all right, she's yours for \$6000 cash."

"All right," replied McMasters. "Come down to the office any day and we will make out the deed and you can get your check." He then rode away up the gulch in a leisurely manner. On returning to Lead, he found the miners on hand with the deed made out ready for signatures and they for their check.

The following day several workmen might have been seen bulkheading the tunnel and others building a flume to convey the water to the Homestake mills at Lead. When the former owners of the prospect saw this they readily understood why the superintendent of the Homestake could condescend to examine a 100-foot tunnel and pay spot cash for it.

There are at the Homestake large compressors, some of them among the largest in the world. Compressed air is employed in drilling and in transporta-

tion both above and below ground. The air and water system are connected, so that in the event of fire underground, the air may be shut off and the water turned on. As the mine is over 1200 feet deep, the system is divided into sections, with 400-foot lifts. This is a wise provision and no great fire need be anticipated underground in these mines now, when this protection against fire and the mining methods now in vogue there are considered.

The mines do not make as great an amount of water as their extensive development would suggest. There is a large steam-driven pump on the 1100 level of the Golden Gate shaft which raises 550 gallons per minute, and a large Cornish pump at the 1100 level of the B. & M. shaft handles 400 gallons per minute. This water is also available for use about the mines.

The mining of such large amounts of ore requires tons of drill steel to be banded daily. Formerly all the drill sharpening and forging were done by hand, requiring the labor of a great many men. Now this work is done by three machine drill sharpeners—one on the surface, one at the 600 level and one at the 800 level, and as each machine turns out 600 drills every twenty-four hours, it will be readily understood how the placing of these machines in the mine, near where the drills are to be used, facilitates handling them. On the 600 level a large blacksmith shop has been fitted up for making repairs and doing general blacksmith work, and this also effects a large saving of time and money. Thus it will be observed that as the expense of mining naturally increased under the old-time methods, as the workings grew deeper, new and improved methods and machinery were introduced to offset the increasing disadvantages, until to-day mining on the Homestake is being carried on at less expense than during the years when conditions were, generally speaking, more favorable than they are at present.

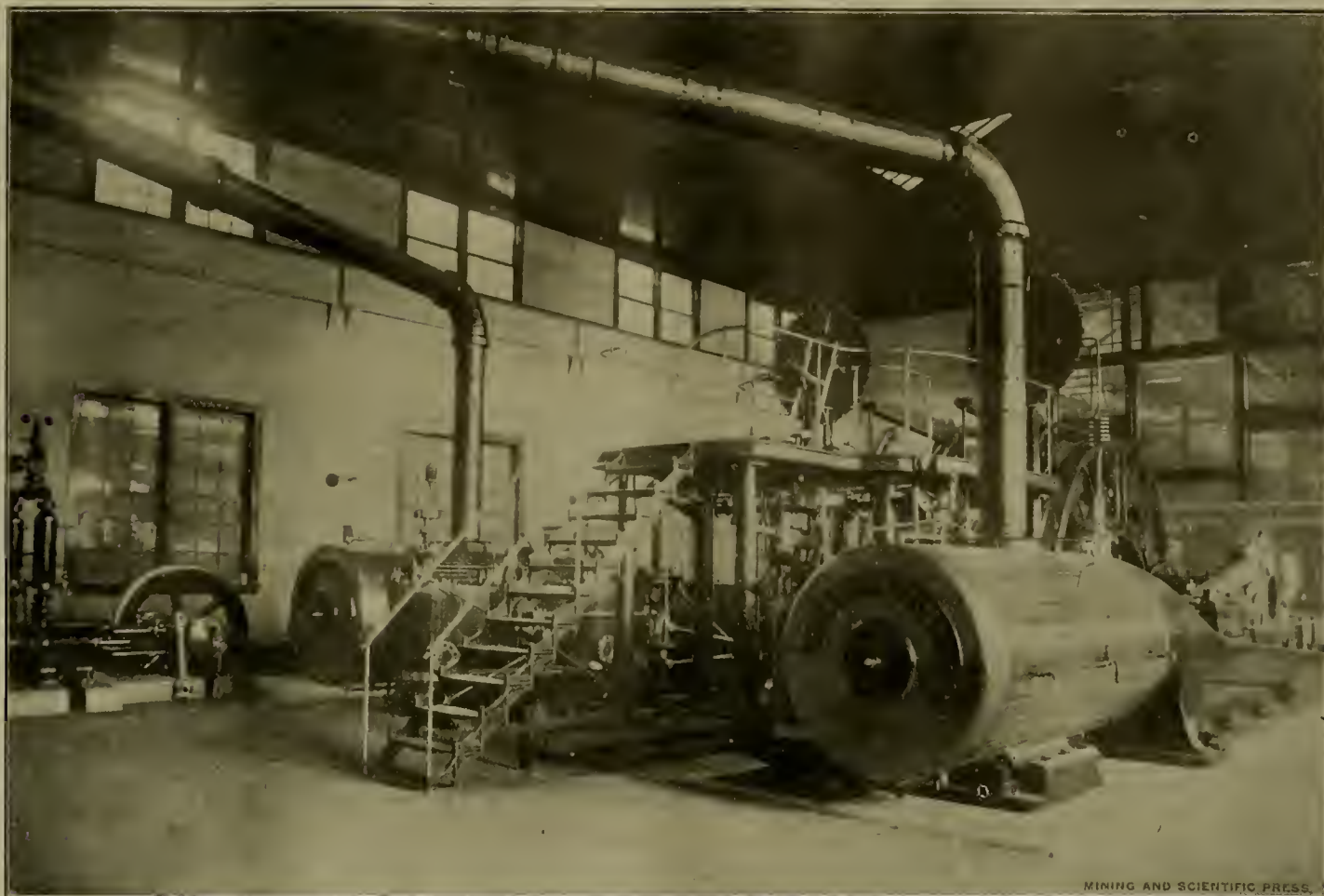
A large amount of rock is still mined at the various properties of the group by the open cut and "glory-hole" methods. By the former the rock is blasted down onto the floor of the cut and is shoveled into cars run close up to the face, the larger blocks being "bulldozed," or "block holed." By the glory-hole or mill-hole method the rock broken down in blasting is drawn off through raises put up from some level below, and is drawn into cars from chutes built at the foot of the raises. This method of handling rock is the cheapest known in mining, and where it can be applied above an adit level, thus dispensing with hoisting, a very few cents per ton should cover the expense in large ore bodies and where the method is properly applied. At the Homestake the ore in the open cuts is shoveled into cars, which are made up into trains and hauled to the rock breakers, from which it drops into large bins. From these it is reloaded at a lower level and sent to the mills to be distributed whenever required.

Mining by the open cut system, as practiced at the Homestake, is now a pronounced feature everywhere of mining practice in large veins which outcrop at the surface. Up to this time all of the ore broken down upon the floor of the open cut is shoveled by hand into the cars. In some mines, particularly at the iron mines of Minnesota and Michigan and also in Wyoming, at the Sunrise iron mines, steam shovels are employed in this work, and this method seems adapted to the conditions in some of the cuts of the Homestake, but has not been introduced there as yet. In the early days some of the rich streaks were gouged out by leasers, who honeycombed their leases, leaving generally insufficient support. As a result the rather soft schistose ore bodies near the surface caved, and at one time many thousands of tons of ore were recovered by topping these caves from below and allowing the fine broken ore to run down to a level below and drawn into cars from a chute previously constructed at the foot of the raise. This ore was run down with little or no blasting, the working of the ground, due to subsidence and subsequent caving, having crushed and broken the most of it to a size which would easily pass the chute doors. It was occasionally necessary to put a man into the cut to work the rock down from the sides with pick and bar. He made himself safe by securing a rope around his waist, the upper end of the rope being attached to a drill driven in at the surface well back from the edge of the cut. Often the ore ran beneath his feet so rapidly that it was with difficulty he kept from being drawn down into the mill hole.

By the open cut system, when the rock is to be blasted, deep holes are drilled by means of the jumper or churn drill. These holes range from 12 to 20 feet in depth, are given a load of 10 to 15 feet from the face and are usually drilled in series—that is, several such holes are put down at one time. The holes are "sprung" repeatedly with nitro powder, and finally, when a chamber sufficiently large has been made by this process, black powder or low dynamite are charged together with 40% nitro powder and the holes fired. The result is variable, dependent on the character of the ore, but it usually dislodges 600 to 1000 tons, and often much more for that series of holes. The larger rocks are bulldozed, or black-holed, and the ore is then ready for the chutes or cars. The methods in open cuts with flat floors or in those provided with mill holes are essentially the same.

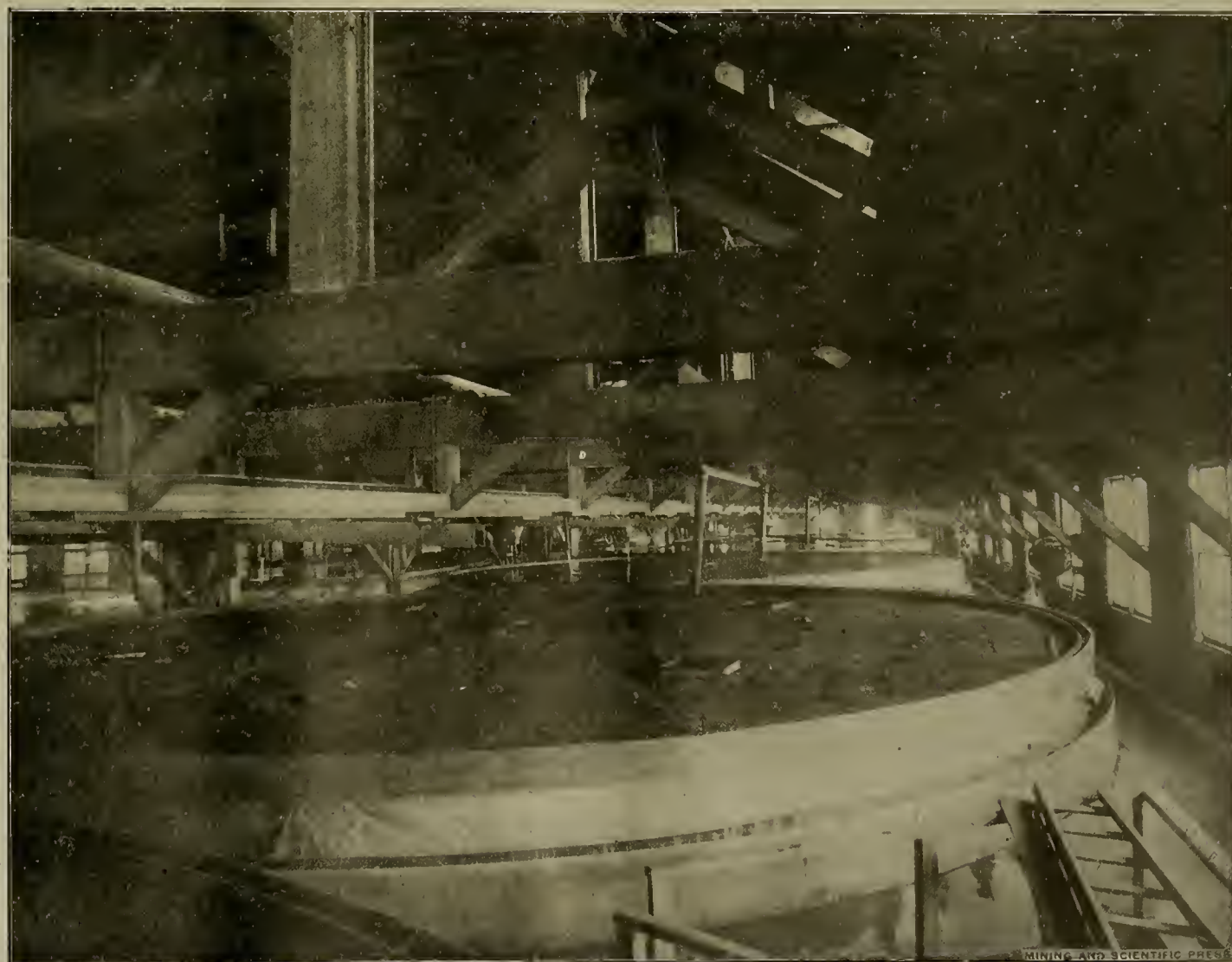
(TO BE CONTINUED.)





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Hoisting Engines, Ellison Shaft, Homestake Mine, Lead City, South Dakota. (See Opposite Page.)



Copyrighted by B. L. Curtis, Lead City, S. D.

Interior of Cyanide Plant, Homestake Mine, Lead City, South Dakota. (See Opposite Page.)



Chinese Methods of Mining Quicksilver.\*

NUMBER II—CONCLUDED.

Written by HENRY BRELICH.

The ore containing the "black" mineral is similarly crushed and treated direct for the metal, without any previous panning.

The circular retort furnaces in which the ore is treated are built in pairs 2 feet 6 inches diameter and 1 foot 6 inches high, and consist of an ordinary cooking pan, which serves as a receptacle for the ore, resting on a round fireplace built of unburned bricks, above which is placed an inverted pan having a hole in the center 12 inches in diameter. On the top of this is built a collar of clay 12 inches high, strengthened on the outside by a plaited network of bamboo, which extends a few inches above the clay collar and serves as a support for the topmost pan. The top of the collar is grooved in the center, and resting on its inner rim is another pan with a 12-inch diameter hole, covered by an earthenware pot, which, when the furnace is in operation, acts as a condenser. An annular space is thus formed between the groove, the lower part of the top pan, and the inner side of the bamboo network. The rim of the clay on which this pan rests is perforated with three holes, 3/4 inch diameter, known as the percentage holes, which are inclined towards the center of the furnace, and the amount of quicksilver collected within the annular space depends on the pitch of these holes, increasing as the angle is increased. The earthenware condenser resting on the top pan is luted with residues and the inside of the bamboo network is lined with clay.

About 50 pounds of ore is charged into the lower pan and heated with wood fuel, the quicksilver vapors condensing in the annular space and the earthenware pot, which is changed at intervals until the ore is exhausted, when the residues are withdrawn by means of a shovel with a blade at right angles to the handle, and replaced by another charge. The residues, especially in the case of rich ores, which still contain imperfectly burned ore, are ground, sluiced and the concentrate again retorted. While the condenser is being changed the ore in the pan is stirred with a wooden pole, and copious fumes escape through the opening. During the operation the condenser becomes coated with numerous minute globules of quicksilver, which, after its removal, are run together by rubbing the surface with a rag, and form in a pool at the bottom of the pot. The losses, as far as can be estimated, vary between 30% and 40% of the total quicksilver.

When treating rich ores, about 1 catty (1 1/2 pound) of quicksilver is collected in each cleanup from one of the earthenware condensers. The metal is poured into bamboo flasks and transported to the river port in pigs' bladders.

The following data regarding the working of these furnaces were obtained from a native smelter treating tailings, where four furnaces (eight retorts) are in constant operation:

Number of men employed per twenty-four hours = three. (The men work at the furnace only twenty-four hours every four or five days to avoid becoming salivated.)

Wages per twenty-four hours = 1200 cash—say 1s per man, or a total of 3s.

Total average amount of ore treated per twenty-four hours = 3000 catties (4000 pounds).

Each furnace is charged per twenty-four hours = seven to eight times.

Average yield, including final recovery when furnace is pulled down, per twenty-four hours = 8 catties (10.7 pounds).

Cost of fuel per twenty-four hours = 3200 cash (about 8s 6d).

The cost of one furnace (two retorts) complete is 4000 cash—say 10s 9d—lasting about one month, during which time it is constantly undergoing repairs.

In addition to the furnaces at work near the mines, a considerable number are owned by individuals who carry on custom smelting, receiving in payment the quicksilver collected in the annular space through the percentage holes. The ore treated in these furnaces is obtained either from the mines or from the dumps, and frequently by theft.

These custom furnaces, producing singly a comparatively insignificant amount of quicksilver, are nevertheless important factors in the production of the metal, as a large percentage of the total output is derived from these numerous sources.

The owners of private mines have a set of furnaces for rich ore, and one for poor ore, and, if the miner strikes a rich pocket, the ore is treated in the "rich ore" furnace, whose "percentage holes" are so inclined that the furnace owner receives about 40% of the total distillate as his share. This is an established custom to which the miners willingly conform.

STORES AND SUPPLIES.—All the necessary stores and supplies required by the miners in connection with their work are produced and manufactured in

the province, with the exception of wick, which is imported from the province of Szechuan.

The following is the cost of the principal articles which may be procured locally:

Wrought iron, per pound.....	s.	d.
Steel, per pound.....	0	1.4
Sulphur, per pound.....	0	2.1
Niter, per pound.....	0	1.7
Charcoal, per 100 pounds.....	0	10.2
Oil, per pound.....	0	1.6
Wick, per pound.....	0	6.8
Firewood, per cord (5 feet by 5 feet by 5 feet).....	8	6.4
Ore baskets, each.....	0	1.4
Wrought iron lamps, each.....	0	3.8
Cast iron pans (used throughout China for cooking purposes), each.....	2	8.0
Wooden pans, each.....	1	7.0

MINING LAWS AND TAXES.—Mining laws are practically unknown, and although of recent years mining regulations have been issued by the imperial government, they have not been enforced, and the natives are ignorant of their existence. The Government owns no land in the neighborhood of Wan Shan Chang, which is the "ancestral" property of two or three families and their numerous progenies.

A Chinese land owner possesses all surface and mining rights within his boundary, consequently any mining carried on in his property entitles him to the receipt of a small tax, which is paid either in cash or kind by the miner. In addition to this tax there are numerous other arbitrary taxes or "squeezes" levied by the officials under whose jurisdiction the mines are situated.

The product of the mines is indirectly taxed through the "ching fu," or weighers, who are the principal merchants of Wan Shan Chang, to whom, on payment of a monthly tax to the prefect, is given the sole right of purchasing all the quicksilver and cinnabar produced, with the exception of that which is produced from those mines where the owner pays a tax direct to the officials, and is thus exempted from selling the product to the weighers.

The price paid by the weighers is somewhat lower than the prevailing market price, usually about 100 cash (3.2d) less per catty, but this deduction is either increased or decreased according to the demands of the market.

The term "squeeze" should logically be confined to the illegal detention or extortion of money. Thus, an official has a right to levy a certain tax in granting rights to work a mine or open a shop, but such rights are most likely to be granted to one who will pay an additional 20% or 30% as a bribe. The legal and just tax levied by an official is, however, commonly called a "squeeze." The author estimates that, notwithstanding all taxes and squeezes, the output of a mine worked by the natives is taxed only to the extent of about 2% on the net value.

WEIGHTS, MEASURES AND CURRENCY.—There is no standard for the weights and measures in use, and there is considerable variation throughout the province.

The catty (1 1/2 pound) is the representative weight, and may be regarded as being fairly uniform throughout China, whereas the picul "dahn," which should be equal to 100 catties, is not a fixed quantity, and when mentioned in a transaction it is always advisable to inquire "of how many catties?"

Quicksilver in quantities above 5 catties is sold by measure and not by weight. The measure used is made of brass and shaped like a truncated cone, 5 inches high, 3 inches diameter at the base, and 1 1/2 inch diameter at the top, and holds when full 5 catties.

The foot "ch'e" is the measure used by the miner, and is equal to about 15 inches, divided into 10 "ch'en," and this again divided into tenths, "fun." Measurements equal to or exceeding 10 "ch'e" are referred to as so many "chang," one chang being equal to 10 feet.

The only coin in circulation is the cash "chien," a circular disc differing in size\*\* and weight, made of copper or brass, with a square hole in the center, through which it is threaded on a string up to 1000 nominally, but actually containing 960 to 980 cash (2s 7d) and weighing 6.2 pounds. Silver ingots, called "uen hao,"† of varying weight and fineness, are also in use, and they are exchanged for cash at a certain rate per ounce ("leeang"‡) of silver, which is dependent upon the fineness of the silver, the quantity and size of the cash, and upon the cash reserve in the hands of the merchant bankers.

Notes of 1000 cash, face value, issued by the bankers are also locally in circulation.

As regards currency, the rate of exchange constantly varies. There is no such coin as the tael, which is merely a name for an ounce of silver. The term is only used in the treaty ports, and is unknown in the interior, where the value of an article is always stated as being equal to so many ounces or "leeang" of silver, which varies in every town. The exchange for an ounce of silver is also variable, and is now, roughly speaking, 1000 cash = one Kweiyang tael, but the author has known it as high as 1400 cash.

For the purpose of this paper the following rate of exchange has been taken:

- 1 Shanghai tael = 2s 6d.
- 1 = 8 Shanghai taels
- 1 Kweiyang tael = 2s 8d.

\*\*"Dien chien," good cash, about 1 inch in diameter. "Mao chien," bad cash, about 3/4 inch in diameter.  
† Called "sycee" at the treaty ports.  
‡ Called "tael" at the treaty ports.

1 Kweiyang tael = 1000 cash.  
1 Kweiyang tael = 1.166 ounce troy of silver.  
1 Kweiyang tael = 1.065 Shanghai tael.  
1d = 31.2 cash.

The Kweiyang tael has been taken in this paper because it represents the tael as used in the provincial capital of Kweiyang.

PRODUCTION.—There are no data available concerning the former output of these mines, hence no attempt at any estimate can possibly be made. It is stated that thirty years ago the output amounted to 7000 catties (9300 pounds) of cinnabar and 3000 catties (4000 pounds) of quicksilver per month, and to have been maintained at these rates for a number of years, when the production of quicksilver increased, while the output of cinnabar diminished.

During the last few years the output has averaged 3000 catties (4000 pounds) of quicksilver per month, while the cinnabar output has been constantly decreasing, and now averages about 200 catties (270 pounds) per month from native sources only.

The metal is exported from Toon-Yen, either in pigs' bladders or iron flasks, to other parts of China, where it is used for the manufacture of vermilion, for which there is a great demand throughout the Chinese empire.

In the following table the price of quicksilver at the mines is compared with the London quotations at the corresponding period per flask of 75 pounds:

Year.	London Av. Price per Flask of 75 Lbs.	Mines Av. Price per Flask of 75 Lbs.
	£ s. d.	£ s. d.
1901.....	9 2 6	6 2 11
1902.....	8 15 0	7 19 3
1903.....	8 12 6	7 17 11
1904—January to July.....	8 0 0	7 1 7

The large cinnabar crystals detached from the ore, and the "red" cinnabar extracted by panning previous to the ore being treated for the metal, find a ready sale in the local markets. It is usually sold in packets of 100 ounces (8.3 pounds), containing varying proportions of fine and coarse cinnabar, at prices ranging from 850 cash to 1300 cash (2s 3.2d to 3s 8.6d) per catty (1 1/2 pound), while the larger crystals, which are now much rarer, are often sold without any admixture of fine cinnabar up to 5000 cash (13s 1.2d) per catty.

CONCLUSIONS.—From the meager information one is able to gather regarding this industry, there is no doubt that the mineral was at one time mined on a very large scale, and that the industry was in a far more flourishing condition, and the output of the metal and cinnabar much greater than it is at present. The extensive underground excavations, which stand as monuments of previous mining activity at the principal localities where the mineral occurs, form conclusive evidence of the work which has been accomplished in former times.

Apart, however, from other quicksilver deposits which may be revealed by further systematic prospecting of the large portion of this province which is as yet unexplored, the condition of those mines now in operation by the natives is such as to warrant the expectation that a constant output will be maintained for many years to come.

Gold and Iron in Black Sands.

Written for the MINING AND SCIENTIFIC PRESS by ALGERNON DEL MAR.

For those interested in the treatment of magnetic sands for both the gold and iron contents a few preliminary experiments may be of interest. I greatly regret that the iron experiments were not accurately recorded and were not followed up on a scale sufficiently extensive to make commercial factors available. I was more interested in the gold extraction, and when I found that the sands would not average up to expectation, the preliminary experiments here recorded were not followed up. As to the gold contents, contrary to the opinion of a writer in this journal (that magnetic sand was not readily amenable to cyanide treatment on a laboratory scale), I had no difficulty in reducing the value from \$3 to a trace. The gold was in the form of fine specks, which could be separated from the magnetic sand by careful panning. This extraction would give a handsome profit on \$3 sand, but the trouble was to find extensive deposits carrying this value.

The sand contained about 60% magnetic iron. To concentrate to a nearly pure magnetic product need present no difficulties with magnetic separators or on concentrators. For my purpose I simply washed off the sand and with the aid of a magnet obtained a nearly pure iron ore. Now the difficulty comes. First, this must be smelted with oil as fuel, and to do this it must be in a form whereby the smelting operation would be practicable. Sand alone with an oil blast is out of the question. A furnace with an inclined bed had already been patented, for smelting copper ores I believe, but this did not appeal to me as practicable for iron ore, so, after many experiments, I at last hit upon the idea of mixing the magnetic sand to a thick paste with crude oil, shaping the "mud pies" into small bricks and, by baking over a wood fire, getting rid of all the volatile oils, leaving the magnetic sand in the form of a hard bri-



quet combined with the fixed carbon and impurities of the oil. Thus far I had succeeded in making briquets containing a certain per cent of carbon, which amount, I regret to say, was not determined. To satisfy myself that iron could be reduced from this briquet, I mixed small pieces with a little coke and, using two crucibles (one inside the other, with charcoal between) and with a bellows I succeeded in obtaining a small quantity of reduced iron. This experiment I consider of value, in so far as it may point the way to future experimenting.

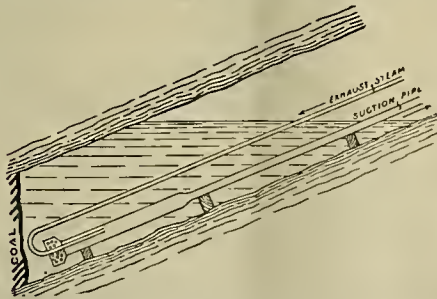
I would recommend the following procedure: Concentrate the sand to a pure magnetic product. Briquet the sand with crude oil, using the gases given off as fuel in the briquetting operation, for power in running blowing engines and for a gas blast independent of the air blast. I have no doubt the successful smelting of magnetic sands can be accomplished along these lines, and I hope others, who have more time and leisure, will work out the scientific and commercial data.

The above process, as suggested by Mr. Del Mar, does not differ essentially in principle from the Eames or Carbon Iron Company's process, wherein iron ores (hematite) were pulverized in Chile mills and this pulp mixed with coke which had been dipped in clay water, dried and pulverized. The charge was not briquetted, but spread on the hearth of a reverberatory furnace and reduced in a reverberatory furnace, natural gas being the fuel employed. The glowing surface of the charge, when fused, was rolled up into balls by means of hand rables, and these placed in a "squeezer" and pressed into "blooms." It made a superior grade of carbon iron, and found ready sale in Pennsylvania, where it was made. That gold associated with black sands can sometimes be cyanided is undoubtedly true, but as the gold so occurring is not always in the same physical condition the results naturally vary greatly. If the gold be comparatively coarse, the cyanide solution works too slowly for satisfactory commercial results. If the gold is chemically combined or mechanically inclosed in the particles of sand, this gold will yield but slowly, if at all, to the dissolving influence of the cyanide.—Ed.

### Exhaust Steam in Mine Workings.

In many of the small collieries in New Zealand steam pumps—generally of the direct acting "Duplex" type—are used, and are not as a rule of very great capacity, says the Minister of Mines. Steam is conveyed to the pump underground from a boiler at the surface, but the exhaust steam often presents a difficulty. If allowed to escape freely into the workings it is very liable to set up conditions inimical to the stability of the roof, besides making everything hot and wet for a considerable area, and therefore the rough-and-ready expedient of allowing the exhaust steam to discharge into the sump water is frequently adopted. This certainly reduces the nuisance, but at the expense of efficiency, owing to the extra back pressure on the pistons caused by the head of water over the discharge end of the exhaust pipe.

A very simple method of meeting the difficulty (which not only gets rid of the undesirable conditions entirely, but actually assists the pump owing to the condensation of exhaust steam and the vacuum obtained) has, on my recommendation, been recently carried out at two small mines with satisfaction to the management. The arrangement is as follows: The suction pipes are laid as usual from the pump into the water-lodge or sump, but the lowest length of pipe is somewhat larger than the pipes above.



The exhaust-steam pipe is carried down alongside the suction pipe and turned into it at the lower end as shown in the sketch. Near the pump a plug tap or cock is placed on the exhaust pipe, but between this tap and the pump a short branch pipe (of the same diameter as the exhaust pipe) must be connected and fitted with a similar tap. These two taps should be connected to one lever so that the operation of opening one closes the other. Before starting the pump to work, the tap on the main exhaust pipe must be closed, and that on the branch pipe opened. On the pump being started this allows the exhaust to discharge into the surrounding at-

mosphere, but it is desirable to continue the branch pipe a few feet past the tap and lead the exhaust into a small tank of water. (In the case of small pumps an oil drum is ample.) When it is ascertained that the pump has got fairly to work on the water, the lever connecting the taps is pushed gently over, and the exhaust steam then passes down the main pipe and into the suction. It is to be remembered that the taps must be reversed by the connecting lever a few seconds before the steam is shut off from the pump to avoid flooding the cylinders, and also that where leather pump buckets are used care should be taken not to let the pump get on air before altering the direction of the exhaust steam, otherwise the heat will damage the leathers.

Actual experiments have demonstrated that an increase of 121% in the working speed and capacity has been attained by the use of this simple condenser. The method has its limits, but is eminently suited to pumps designed for comparatively low heads.

### The Rational Design of Head Frames.

TO THE EDITOR:—With reference to the comment that Mr. Chodzko makes on my notes on head frame design, I venture to call attention to the fact that my former article on this subject was published before the publication of his design for head frame on the Mother Lode, and that a drawing is now in my possession dated March, 1899, which is substantially the same as the diagram accompanying my last notes.

I am far from making the claim that no head frames have been designed having the back columns in the plane of the resultant working stress, but, on the contrary, I have no personal knowledge of this principle having been consistently applied in such a manner as to take full advantage of the possible economies of material inherent in this design, as presented recently, and in Mr. Chodzko's head frame I note that the dimensions of the steel employed in the front columns is apparently the same as in the back, where the heavy working strains occur, and a concentration of material would naturally be expected.

In conclusion, I would call attention to the fact that in my design the weight of the sheaves and the working strains are taken by the ends of the compression members direct, eliminating all eccentricity of strains. This arrangement is absolutely necessary for mathematical consistency, and I am more interested in its value than in its origin, although, so far as I know, the design shown as a whole is original, and dates from the early part of 1899. The following from my former article on this subject makes the principle involved so plain that anyone could have made up such a design without difficulty:

But in cases where the cost of material, erection and freight is so great as to call for the best possible use of material and labor, it would be possible to design a frame that, although not more rigid than the form above discussed, would be equally so, and would not require more than about 60% of the amount of material. In this form the main strength would be concentrated in a panel set in, or a little back of, the plane of the mean resultant of the strains due to the tension on the ropes. No matter how suddenly this strain is applied, the resultant is always the same, and the strain on the panel could only be compressive, having no tendency to pull it back or throw it forward. This being the case, the rest of the structure could be designed with only sufficient strength and rigidity to carry the weight of the main compression member, which, owing to its inclined position, would tend to fall toward the shaft.

The part of the structure in front of the main compression member would be merely a light framework, with its main members designed to resist tension rather than compression, and would carry the guide posts and part of the platform surrounding the sheaves. It would be well anchored to a heavy foundation, so that in case of overwinding (when the resultant, owing to the fact that the cages would foul the sheaves, would fall outside the axis of the main member, and would coincide with the center of the rope), the vertical members of the light bracing would be able to resist the tensile strain that would result and prevent overturning the structure, the strain possible being proportionate to the strength of the rope, the base in side elevation to the structure, and the distance from the base of the main member to the center of the rope, at right angles to the rope.

This last distance would always be somewhat greater than the base of the structure in side elevation, owing to the fact that the vertical members of the front bracing would be set back of the shaft, but the difference would not be so great and the limit of tension that could come on these members through the fouling of the cages would be practically the strength of the rope, and it is plain that if the section is sufficient to sustain the weight of the main compression members, it would be amply strong in tension to break the rope.

In the end elevation of this type of frame the main compression members would be brought as near together at the top as possible, and well spread at the base for lateral stability, but the front bracing could be vertical and consist of three main members tied to the compression panel with light braces, firmly connected at the top and well anchored at the base to a heavy foundation.

Although this design is, in the opinion of the writer, perfectly practical and based on correct mathematical principles, it is so revolutionary and defiant of all tradition that it is doubtful if most mine managers would have the courage to construct one on these lines, and so long as the form that has been adopted for the Nevadaw and High Ore mines is not considered too expen-

sive, there would be no particular object in using this, but where the question of freight and material is of the first importance this design certainly offers a method of obtaining the greatest results for the amount of material employed, and by the introduction of iron tension rods in the vertical members of the front bracing the design is as well applicable to a wooden frame as to steel, and the economy of material equally striking.

GEO. S. BINCKLEY.

### Park City Mining District, Utah.\*

Written by J. M. BOUTWELL.

Since the publication of the last statement on this district, in Bulletin No. 225 of the United States Geological Survey, the extensive exploration there described, which had then been persistently carried on for more than a year without adequate results, has at last been rewarded by valuable discoveries. The object of this sketch is to give an account of the general results of this successful prospecting and of the principal recent mining developments. In the earlier statement it was pointed out that as a result of the extensive exploration "some slightly mineralized ground has been opened, a small amount of ore has been discovered, and in the ground which was more wisely located the indications are good." During the last year these indications have materialized, and, although nothing comparable with the Quincy strike is yet announced, new ore bodies have been found, and three of the new properties have begun shipments.

At the Kearns-Keith mine extensive beds of sulphide ore with some carbonate have been discovered in the foot of the main vein. In the course of cleaning out old workings and connecting the mines forming the present consolidation, including Crescent, Apex, and Hanauer workings, considerable ore has been taken out and the main vein has been opened in new ground—notably to the southwest. The new concentration mill, a copy of one unit of the Silver King mill, has been in daily operation on the ores from this property and makes regular shipments.

In American Flag ground a strong ore-bearing fissure has been opened to a depth of more than 1000 feet, and at a number of levels for several hundred feet along its strike. Although no attempt at stopping for regular shipments has yet been made, several carloads of ore taken out in the course of development have been shipped. These yielded excellent returns, indicating that the ore carries good values in silver, gold and lead, and some copper.

In the New York one result of considerable exploration has been the discovery on the 400-foot level of a fissure, which, on being opened down to the 600-foot level and below, has yielded several shipments of high-grade silver-lead ore with accessory gold. In the Naildriver prospecting has ceased and a reduced force has been taking out ore struck several years ago. The Scottish Chief has made additional shipments of rich ore and continued active exploration. Some ore has been extracted from the Comstock and California, which was treated in the mills at those properties. The old Glencoe property has been reopened and the mill and mine are being put into shape for regular work. In some of the other smaller properties, in which work has been begun in only comparatively recent times, development is still actively in progress. After encountering unusual difficulties from water, the management of the West Quincy property has effected an agreement whereby its ground will be opened and worked at a depth through the Little Bell.

In some of the great properties encouraging results have also attended prospecting. In the Daly West, a strong ore-bearing fissure, the back vein, which has afforded considerable ore in the adjoining Daly-Judge property, has been found, and its ore is being actively stoped. The great Daly-Daly West vein, the main single fissure of this property, has been opened to the 1550-foot level and found to carry a large body of milling ore. Arrangements have been perfected with the Ontario and Daly companies for extending the 1500-foot level Ontario and 1700-foot Daly into the Daly West and prospecting its ground at this depth (2100, Daly West). With a view to treating the increasing amount of milling ore yielded by this mine, the capacity of its concentrating mill has been considerably enlarged and a tailings plant erected and equipped with the Sherman classifiers and slime-settling tanks, Wilfley tables (ordinary), and Wilfley slime tables.

In the Daly-Judge, exploration of virgin ground at a depth on the west has already resulted in cutting some very high-grade ore. As a result of prospecting in promising ground of the Daly, through the Mazepa shaft, those upper workings have been closed and the old Federal tunnel is being driven ahead to prove this ground at a depth. The other properties, large and small, have maintained their regular operations.

These newly discovered ore bodies, with a single exception, occur as veins in northeast-southwest fissures. The exception is the replacement ore in the Kearns-Keith, which lies in beds in the foot wall of

\*See illustrations front page.



the main fissure and takes the place of portions of limestone strata. In the Silver King and Daly West mines no new bodies of high-grade "bedded" ore have been recently found comparable to those which afforded the large shipments of crude ore. Considerable areas of the ore-bearing limestones remain unexplored, however, in each of these mines, and they are now being extensively and thoroughly prospected. The boom in 1902 resulted in an unprecedented number of new locations, the incorporation of several large companies, and a vast amount of prospecting. During 1903 the mining industry gradually resumed its normal condition, and newly formed companies settled down to persistent, serious development work. The last year, 1904, has witnessed the successful outcome of this extensive exploration in the discovery of ore and the addition of three shipping properties. This tends in a measure to offset a decrease in the annual output from the camp. Furthermore, the discovery of new ore bodies in large mines, promising developments in other properties, amicable arrangements between neighboring companies for prospecting through adjoining ground, and various surface improvements mark important progress in the mining industry in this district during 1904.

## THE PROSPECTOR.

The rock samples from Descanso, San Diego county, Cal., are typical norite, a basic igneous rock, in which large crystals of feldspar and hornblende form a prominent characteristic feature, giving to the rock mass a spotted appearance due to reflection of light from the cleavage planes of these crystals, but which spots on the rock disappear upon changing the position, and a new set making its appearance. Similar rocks occurring in the Lake Superior region have been called by J. D. Irving lustre-mottled rocks.

The rock specimens from Table Rock, Cal., are determined as follows: No. 1 is a typical syenite, consisting of orthoclase, feldspar and hornblende. No. 2 is probably diabase, judging from its structure, but the rock is too much decomposed to make its identification positive; it contains pyrite. No. 3 is amphibolite schist (talc schist), carrying a large percentage of pyrite (iron sulphide). No. 4 is an altered rock, probably granite or grano-diorite, much silicified and carrying pyrite; it is essentially an ore and may contain gold and silver. No. 5 is a metamorphic rock in which there is a development of considerable garnet, with little veins of iron oxide and quartz. No. 6 is a much decomposed rock, probably diorite or granite. The feldspars are wholly kaolinized and quartz is not abundant. The rock contains bunches of iron sulphide, and may contain gold and silver.

The rock samples from San Rafael, Cal., are: No. 1, glaucophane schist. The blue mineral is the variety of hornblende known as glaucophane. No. 2 is red jasper. It contains no cinnabar. The red color is due to microscopic particles of red iron oxide.

The rock samples from Golden, N. M., are metamorphic, probably on a granite contact. The rocks contain a granular mixture of quartz and feldspar, with abundant garnets and calcite. The bright scaly metallic mineral is specular iron (a variety of hematite). There is also much epidote (green mineral), and magnetite in black grains scattered through this interesting rock. The most prominent constituent is the brown garnets.

The sample of black sand from Ketchikan, Alaska, consists principally of iron ore in the form of rounded grains, of which about 25% is magnetic, the balance being non-magnetic and is probably titanite iron. The lighter colored grains are quartz, epidote and other hard minerals. No gold can be seen with the aid of a powerful loupe, an unusual thing in auriferous beach sands. Still, the gold may be present. An assay would determine this. If the gold is not free, it is doubtful if it can be saved by amalgamation or cyaniding, but concentration might increase its value somewhat, whether the gold is associated with the iron grains or with the quartz grains. The elimination of either would raise the value of the remaining material. Some experiments should be made with this sand.

The rocks from Randsburg, Cal., are: No. 1, diorite. The rock contains a small amount of pyrite. No. 2 is considerably altered, but is apparently diabase. No. 3 is a semi-schistose diorite and has been silicified and otherwise metamorphosed.

It is difficult, if not impossible, for the prospector to distinguish the various types of greenstone, one from another, in the field. Diorites and diabases look much alike, and the general field term greenstone is sufficiently close and answers every purpose. Moreover, it is understood by geologists generally that when the term "greenstone" is employed, a doubt as to the exact classification of the rock is expressed. Porphyry is an equally convenient name

for many acid eruptives, and is so understood by most geologists, though some restrict the application of the name to those rocks having porphyritic crystals.

## Boiler Waters and Their Treatment.\*

NO. II—CONCLUDED.

Written by W. M. BOOTH.

In answer to letters sent to several of the largest firms of the United States, I have received the following: (The names are withheld, as it was assumed that this was a confidential matter).

1. "We have your letter of January 28 asking for our opinion as to the best material for use in softening water.

"The principal trouble with the water in this neighborhood is that it contains free sulphuric acid, together with the sulphates of lime and magnesia. In order to counteract the effects of these salts, we have been introducing sodium carbonate directly into the feed water. This treatment, of course, does not prevent the formation of a scale in the tubes and we find it necessary to use a mechanical cleaner at least once in four weeks.

"It is our opinion that the feed water should be treated and the scale-forming solids removed before the water is pumped into the boilers, and it is our intention to provide an arrangement of this kind in the near future.

"Owing to the cost of most of the chemicals which will soften water, such as we have here, we believe that the most satisfactory materials are sodium carbonate and lime."

2. "Referring to your inquiry of the 28th inst., regarding water softening for steam boilers, we beg to say that we have used several of the special compounds in the market for this purpose and several compounds act effectually in the absence of a regular purifying plant.

"We use at several of our works the regular lime and soda process, which are the essential elements in the principal water-softening plants, the difference between the apparatus being one principally of detail of operation. When the proportions of lime and soda are properly regulated to suit the particular water used and care taken that neither of the chemicals be used in excess, it is probable that the best results now known can be thus obtained."

3. "Yours of the 25th received.

"We use nothing to soften our water before it reaches the boilers. We use a boiler compound and find that there are several in the market, any one of which is good. These compounds are composed mostly of soda ash and tanning matter. We have also found that when the boilers are idle, a solution of soda ash put in and allowed to stand several days softens the water and prevents scaling."

4. "We are in receipt of your letter of January 28th, asking an opinion in regard to the best material for use in softening water for use in boilers. It is impossible to give an opinion without the knowledge of each individual water to be softened.

"Of course you know that soda ash, tri-sodium phosphate and lime are all of value, when used with the proper waters. Zinc and coal oil have in certain cases been found successful."

5. "Your favor of January 25th was duly received here and we beg pardon for not having replied before this time. However, we hardly know what to say to you in regard to boiler compounds and our experience, in taking care of our boilers, to keep them free from scale, as it has been a study with us for years and we have never been able to find anything that is perfectly satisfactory.

"In some of our boilers we use condensed water, from the steam-heating coils, also the water from the roofs, but that is confined to the shell boilers. In these we use tri-sodium phosphate, putting it directly into the boilers, also using the proper tools to clean the boilers with, and in this way we have got along very well, but our water-tube boilers constitute another problem.

"We have never been able to use tri-sodium phosphate in the water-tube boilers, as it would make the water foam. What we use in connection with these is a filter, and while we do not obtain perfectly satisfactory results, it works better than any other plan we have tried. The filter plant is charged with caustic soda and quick lime. We could not state the exact proportions, but it is governed by the tests of the water as it goes to the boiler; these the writer does not exactly understand. But in this way we arrange to keep our boilers in a very satisfactory condition.

"The water we use varies somewhat in scale-producing properties, as it is much higher at certain times during the year, containing more lime. So there is no rule we can establish to keep the boilers in perfect condition. We have to scrape the tubes occasionally and go over them once in about three weeks. We would be very glad to find some means of purifying the water perfectly, but this is no doubt impossible."

6. "Referring to your favor of January 28th, in which you request that we give you our opinion in reference to material for use in softening water in

\* The Chemical Engineer.

boilers, and also before the water reaches the boiler, we would say that as far as our plants are concerned, it is not necessary for us to use any water-softening apparatus, for the water is sufficiently soft for our purpose and does not necessitate any further softening.

"We have at times used kerosene oil to prevent the scaling, and the same has been of some service. We have also found that a water-feed heater can be used to advantage for purifying the water, cleaning this heater out very frequently.

"Owing to the fact that hard water has not been one of our problems, we have never made a study of the subject, and for that reason we can hardly give you our opinion. By getting into communication with the manufacturers of any water-softening apparatus, you could doubtless obtain much information that would be of service."

7. "Replying to yours of the 18th concerning water purification. As the material used for softening water, either in tanks or in boilers, varies with the water found in different localities, it is desirable to make a chemical analysis of the water it is desired to soften, before applying the remedy, and as this varies so much in different localities I would suggest that you take the matter up with railroad companies in different part of this country.

"The Chicago & Northwestern, Southern Pacific, Rock Island, Santa Fe and a number of other roads have gone into this question quite extensively. You will also find a large amount of information in the railroad papers. I think there was quite a complete report published by Mr. Davidson, chemist and engineer of tests of the C. & N. W. Ry. in the proceedings of the Western Railway Club some time ago."

8. "In answer to your specific questions, I can only say that it appears to be impossible to give any general rule for the proper treatment of boiler waters. Some of them need no treatment at all, and others are so bad that it hardly appears practicable to render them fit for use by any treatment at all. Our own practice is to analyze troublesome waters before giving an opinion concerning them. The treatment recommended is then based on the analysis. It often happens, of course, that the nature and amount of the dissolved solids are already known by a previous analysis by some other chemist, as, for example, when the water is drawn from a city supply. In such cases we do not have to make a new analysis. Unless the character of the water is known to have materially changed since the first one was made; but in every case, as I have said, it is our intention to know just what the particular cause of the trouble is, before suggesting any specific treatment.

"Soda ash is undoubtedly the commonest substance in use for the prevention of scale or corrosion."

In concluding this paper it is difficult to sum up the most important factors in connection with the purification of boiler waters. A great variety of mechanical and chemical appliances has appeared. It is pretty generally conceded that pure distilled or rain water cannot be used for boiler purposes, and where its use is compulsory, it is the custom to lime the water slightly. The active form of air and other dissolved gases found in rain water is capable of causing severe corrosion at the ordinary temperature; without the aid of incrusting solids of any kind. The problem becomes very complex when we add heat, pressure and chemical salts. It is under these circumstances that we have to resort to settling tanks, feed-water heaters, coagulants, boiler compounds and water-softening plants, and each finds its place in the special treatment required for a special water.

## The Mint and the Miner.

The United States Mint comes into frequent and direct contact with many producers of gold and silver, but there are many more whose knowledge of mint regulations and charges is either uncertain or erroneous. For the benefit of the latter class the following is printed:

Revised table of charges at the mints and assay offices of the United States, as fixed by the Director of the Mint, and approved by the Secretary of the Treasury, January 2, 1900:

1. MELTING CHARGE.—A charge of \$1 shall be imposed for each melt of bullion, except in the case of uncurrent United States coin and fine mint bars.

2. PARTING AND REFINING BULLION (rate per ounce gross).—On silver bullion containing less than 300 thousandths of gold, three-fourths of 1 cent per ounce. On bullion containing from 300 to 500 thousandths of gold, 2 cents per ounce. On bullion containing over 500 thousandths of gold, 4 cents per ounce. Silver allowed the depositor shall be calculated on the basis of refining the gold to 990 thousandths. When bullion contains less than three-tenths of a thousandth of gold it shall not be reported for the benefit of the depositor. Base bullion containing less than 300 parts of gold per thousand shall pay a charge of 2 or 3 cents per ounce, or such material may be declined, at the discretion of the chief officer. If the alloy be all good copper when but one of the precious metals is present, the charge may be one-half cent per ounce.

3. REFINING SILVER (rate per ounce gross).—A refining charge of three-tenths of a cent per ounce shall be imposed upon silver bullion free from gold, assaying from 998 to 999½, and a charge of four-tenths of a cent upon such bullion assaying from 980 to 997½. Bullion



below 980 shall be subjected to the parting or refining charge of three-fourths of a cent per ounce.

4. TOUGHENING CHARGE.—

Gold bullion ..... 1/4 to 2 cents per ounce gross.  
Silver bullion ..... 1/4 to 1/2 cent per ounce gross.

This charge is made to cover the cost of fitting brittle fine bars for coinage operations and shall not be imposed upon unparted bars except in special cases where it is necessary to toughen an unparted bar returned to the depositor; or, when the bullion contains iridosmine, etc.

5. COPPER ALLOY.—Two cents per ounce of copper required.

6. BAR CHARGE.—On bullion deposited for fine bars not required to be parted or refined, and for standard or unparted bars:

Bars of fine gold per \$100 value ..... \$0.04  
Bars of fine silver per ounce ..... .001  
Bars of standard gold per \$100 value ..... .10  
Bars of standard silver per ounce gross ..... .001  
Bars of unparted bullion per ounce gross ..... .001  
Small gold bars (less than \$5000) ..... .05 per \$100.  
Small silver bars (less than 125 ounces) ..... .001 per ounce.

The following rules for the guidance of depositors in making shipments of gold bullion to the United States Mint, San Francisco, Cal., have been made by Frank A. Leach, superintendent:

No. 1. No shipment of less than three troy ounces will be received.

No. 2. All express and other charges must be prepaid.

No. 3. Each shipment must be securely packed and sealed.

No. 4. Address the shipment to "Superintendent, U. S. Mint, San Francisco, Cal.," giving name and address of consignor.

No. 5. Forward a letter by mail notifying the mint of the shipment, giving its approximate value, and, if convenient, the number of ounces, troy weight; also directions as to the disposition of the proceeds. We must have specific instructions from the consignor in regard to the returns, as we cannot file the shipping tag nor assume any authority therefrom.

All remittances of money, checks, drafts or money orders from the mint in payment to depositors are sent at their risk. The Government assumes no responsibility after the money leaves the mint, it being forwarded simply as an accommodation.

Something More About Head Frames.

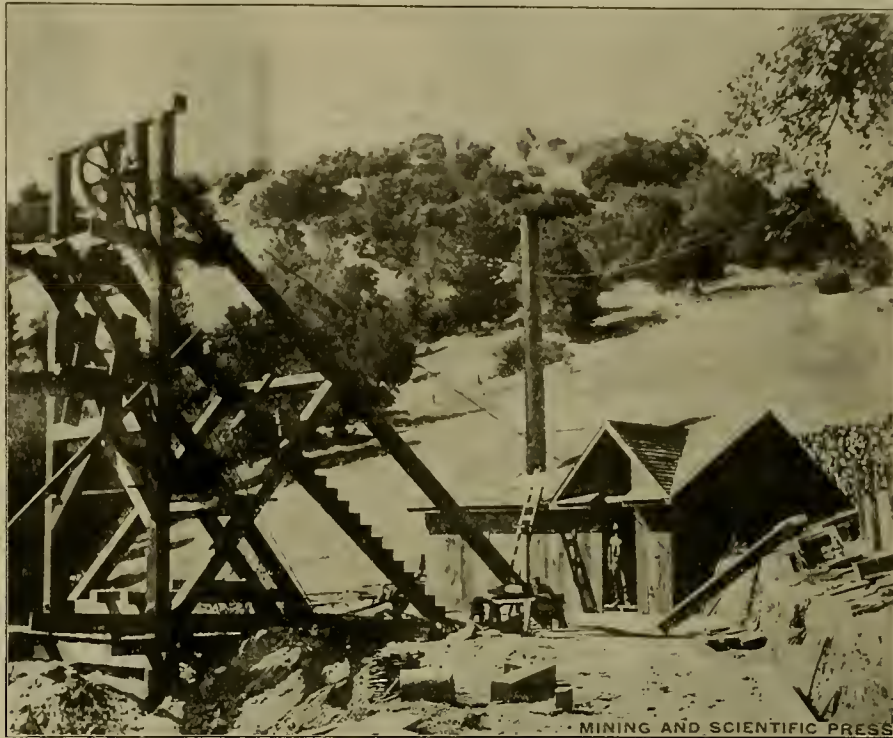
The elementary principles which underlie head-frame construction are well understood by engineers who have been brought into contact with this branch of mechanics. Under ideal conditions the engineer can build ideal structures; but often topographical considerations and the requirements of the particular mine where a frame is required make ideal construction difficult. In some instances the hoisting plant may be set on the foot wall side of the vein, where it properly belongs, and in other cases it may be advisable to place it on the hanging wall side—this due usually to topography or to property lines. The ideal frame was described herein in the issue of June 10; but topographical conditions may necessitate a change from the detail of the frame there illustrated, while its principal engineering features remain the same. In that frame the idea of placing the shaft of the sheaves directly in line with the main compression members—the back braces—is advised. In the accompanying illustration, which is that of a



A New Zealand Head Frame.

frame at a coal mine in New Zealand, the sheaves are set directly on top of the posts. This peculiarity in design results in the compressive stress beginning at a point above the main compression members, but falling within them at the bottom of the frame. In general design the frame approaches that described in the issue of June 10, but actually it is more like that at the High Ore mine at Butte, Mont., which was also illustrated in that number. The other

illustration shows a head frame constructed under some difficulties of situation. It is a 2-post frame in Amador Co., Cal., and was built on a substructure of posts and cribbing, owing partly to the topography and partly to the nature of the ground, which was soft and offered poor support to the frame without these precautions. The hoist is situated on the hanging wall side of a vein dip-



A Two-Post Head Frame, Amador County, Cal.

ping at an angle of 50°. This frame was so constructed that it could be removed, if desirable, without any detriment to any of the timbers in the frame. No spikes were used in this construction. The timbers were framed with mortise and tenon and some members were dovetailed in, particularly the tie beneath the sheave and the upright posts supporting the sheave boxes. This frame is not represented as a high type of engineering, but as a frame of simple construction, which any carpenter can frame and build if given the design and dimensions. The frame after being in use several months was removed and set up at another mine.

The Treatment of Refractory Auriferous Sulphides at the Cassilis Mine, Victoria, Australia.\*

Written by FRANCIS B. STEPHENS.

The Cassilis mine, of which I have been manager for the last two years, made the first serious attempt to cope with the difficulties attending treatment of the refractory ores of that district, and a fair measure of success was met with, an extraction of about 85% of the value of ore crushed being obtained at a cost that compares favorably with those of mines treating much simpler ores.

While the ore at the surface in this district is very rich, giving returns of as much as ten ounces to the ton, there is a steady falling off in value in depth until at 600 feet the decrease in gold contents becomes serious. So marked is the falling off, accompanied by an increase in the refractory nature of the ore, that many of the smaller mines closed down after reaching 300 feet, and at the Cassilis improved methods of extraction alone permitted work to be continued at depth. The main body of ore comprises a band of dense sulphides consisting of arsenical pyrites, iron pyrites, zinc blende, galena, and carbonate of iron, while antimony, manganese, copper and tin occur in proportions usually of less than 1% each. The gold values range from one to ten ounces, averaging from three to five ounces, and a hand sample crushed and subjected to magnetic separation showed as follows:

Products of Magnetic Separation—	Per Cent by Weight.	Gold Per Ton Oz. Dwt.	Silver Per Ton. Oz. Dwt.
Pyritic concentrates (chiefly iron and arsenical pyrites).....	75.2	3 19	1 17
Quartz and gangue.....	18.3	Nil.	Nil.
Zinc product.....	3.6	2 5	2 12
Lead concentrates.....	2.9	0 13	0 14
	100.0		

The various minerals in this lode occur sometimes banded, but usually as a coarse mixture, and in places one of the minerals will occur in large masses to the exclusion of the rest. Large masses of galena and zinc blende are met with in this way. Lying next to this sulphide band there is usually a band of breccia

heavily charged with fine-grained arsenical pyrites and carrying about 7 dwts. of gold per ton; this is the most troublesome of all the minerals to treat, owing to the amount of slimes made in crushing.

Outside these two layers, and next to the country rock, the filling of the fissure consists of green talcose rock and green quartzite more or less charged with iron pyrites of low value. Large masses of mica

and talc are met with throughout the gangue, and crystals of andalusite occur in bunches. In the upper levels, where tourmaline granite occurs, the reef carries a considerable amount of tin, concentrates showing as much as 3%; in the lower levels no tin was noticed. Drilling in the sulphides liberated very poisonous gases, which sometimes drove the men away from the machines and brought on violent vomiting, no doubt due to arseniuretted hydrogen. In the outcrop orpiment (yellow arsenic sulphide) was common, and was usually a sign of richness; samples of pure orpiment have been obtained assaying up to sixty-two ounces of gold per ton.

The plant used for treatment consists of a jaw crusher, 16 by 9 inches, self-feeders, twenty head of 1000-pound stamps, silvered copper plates, four 3-cone hydraulic classifiers, six Wilfley tables and four Berdan grinding pans. Tailings go to settling tanks for future cyaniding, and concentrates are roasted for chlorination, while the galena is shipped to smelters after grinding. A drawback to chlorination in this district has always consisted in the large percentage of galena carried by most of the ores, and copper is also occasionally troublesome. Zinc blende after roasting is quite amenable to chlorination, our concentrates sometimes carrying 20% of zinc.

The galena is separated on the Wilfley tables and subjected to special treatment, thereby getting over the trouble in the furnaces due to fusion of the sulphides, a matter of some consequence with galena, running sometimes as high as 7% on the ore crushed.

The ore is crushed to pass an 18 by 20-mesh screen, and after crushing the pulp is run over silver-plated copper plates, giving a fall of 1 1/2 inch per foot to keep the plates clear of fine galena.

The amalgam yields a return of one-fifth to one-seventh of smelted gold. Before the employment of classifiers great losses of gold and mercury took place, but since their introduction the gold and mercury are caught in the galena streak on the Wilfleys. Only 20% of the total gold is obtained by amalgamation, though the concentrates show no visible gold on panning, except when rusty patches are struck.

Each five head of the battery have a series of three conical sheet steel hydraulic classifiers under a head of 20 feet of water, having diameters respectively of 12, 18 and 24 inches. The product from the four top-most compartments was run on to two tables, the middle product on to two, and the fines on to one table. When concentrates were made in heavy quantities, using a larger amount of water than was customary, an overflow to waste had to be made at the third cone to prevent flooding the Wilfleys, which before the introduction of classifiers had proved a serious trouble.

The Wilfley tables are set on very solid foundations, and all wear is taken up at once. To obviate any tendency for the wooden r file slats to buckle between the tacks and allow fine concentrates to pass into the tailings the slats are made of specially selected wood.

(TO BE CONTINUED.)

\*Trans. Inst. Min. and Met.

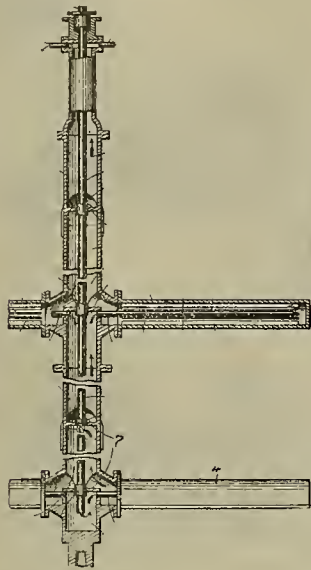


# Mining and Metallurgical Patents.

PATENTS ISSUED JUNE 13, 1905.

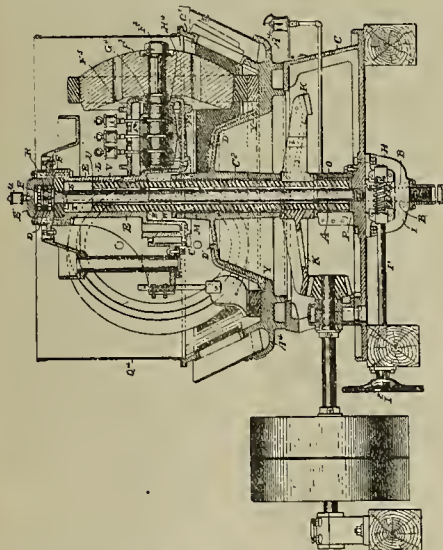
Specially Reported and Illustrated for the MINING AND SCIENTIFIC PRESS.

ROASTING FURNACE.—No. 792,053; F. Klepetko, New York, N. Y.



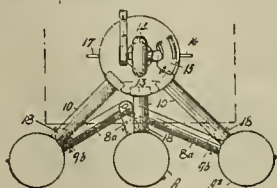
In furnace having one or more hearths, hollow rabble shaft and hollow arms thereof, conduits for directing current of air from shaft into hollow arms, and ribs disposed in path of currents traversing arms, ribs following general longitudinal dimensions of arms.

CHILIAN MILL.—No. 792,161; S. H. Pitkin and J. H. Stratton, Akron, Ohio.



Combination with pan or mortar having central bearing or hub, upper end of which is chamfered, of drive head, hollow sleeve passing through hub or pan of mortar and having feather-and-groove connection with drive head, spindle engaging drive head and having thrust ring for supporting latter, spindle having oil duct leading from upper end to point above upper end of hollow sleeve, short pipe for discharging oil in duct onto chamfered upper end of hollow shaft or sleeve, and flange on drive head and engaging driving shaft or sleeve for directing oil down to chamfered upper end of hub of pan or mortar.

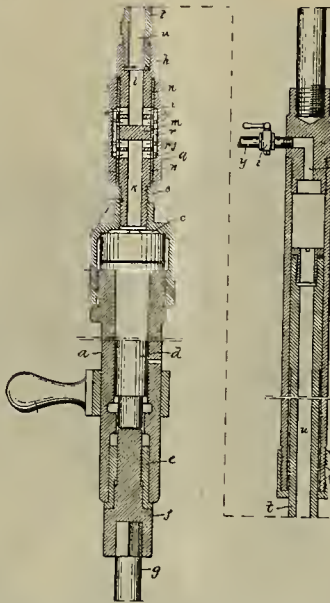
METALLURGICAL FURNACE.—No. 792,223; J. W. Lansing, San Francisco, Cal.



Combination of furnace having plurality of upright interconnected furnaces each having normally closed ore chamber and firebox beneath ore charge, water-containing receptacle, connection between ore chamber and receptacle, stack separate from and devoid of connection with water-containing receptacle, connections between fireboxes of furnaces and

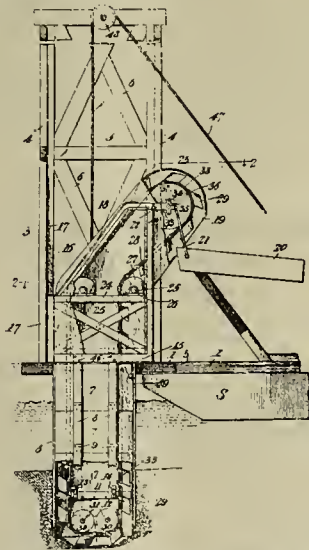
stack and valves in connections by which heat of furnace fires may be diverted from ore chambers, means for inducing draft through receptacle, and ore chambers and intermediate connections, and means for maintaining continued circulation of cooling fluid through receptacle.

DRILL.—No. 792,023; C. H. Haeseler, Philadelphia, Pa.



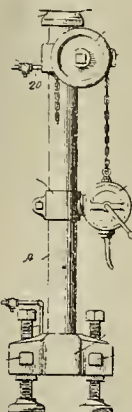
In combined hammer drill and feeder, combination, with feed cylinder and piston, of hammer drill secured to feed piston, feed cylinder having continuous passage extending from source of motive fluid supply to interior of hammer drill and including pressure area back of feed piston, throttle valve between pressure area and hammer drill for controlling hammer drill and throttle valve back of pressure area for controlling feed piston.

GOLD DREDGING MACHINE.—No. 792,250; S. L. Crawford and L. J. Crawford, Hoquiam, and W. F. Crawford, Bremerton, Wash.



In dredging machine, hood, casing supported thereby, and excavating mechanism arranged within hood and casing and having active portion operable in horizontal plane.

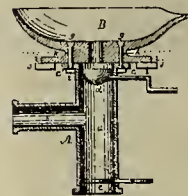
MECHANISM FOR LIFTING ROCK DRILLS.—No. 792,217; J. Jenkins, Lord, Md.



In rock drill lifting mechanism, combination with column bar, of cylinder and piston within column bar

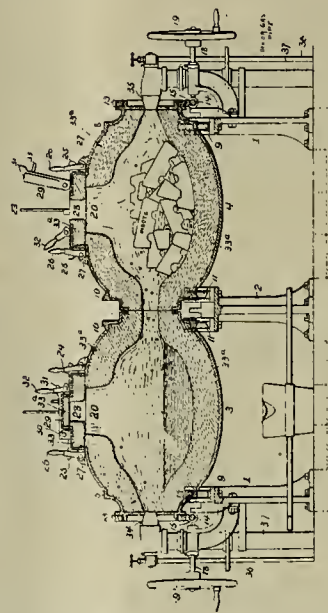
having motive fluid inlet and outlet, drill casing and means connecting piston and drill casing for imparting motion from piston to drill casing.

TUYERE IRON.—No. 792,179; C. O. Swenson, Minneapolis, Minn.



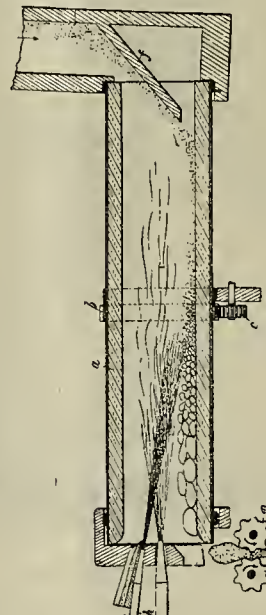
Combination with tuyere iron fixed in forge and having lateral branch, and horizontal flange on upper edge, flange being formed with plurality of oppositely disposed segment shaped slots, of two parallel supports fixed in forge, one on each side of flange on upper edge of tuyere iron, and with upper surfaces aligned with upper surfaces of flange; rotary concave fire pot having horizontal flange, flange resting on flange of tuyere iron and on upper surfaces of supports, and bolts passing through bottom of pot and through slots in flange of tuyere iron.

ROTARY FURNACE.—No. 792,169; W. S. Rockwell, New York, N. Y.



Furnace comprising two communicating chambers mounted end to end, chambers being independently revoluble, means for supplying fuel to each chamber, door closing charging and pouring port in each chamber, second door closing port in each of first mentioned doors, and independent means for securing doors in closed positions.

METHOD OF CONVERTING GRANULAR OR PULVERULENT MATERIALS INTO LUMPS.—No. 792,449; E. Pohl, Harsum, Germany.



Process for converting granular or pulverulent materials into pieces or lumps, consists in roasting materials by introducing materials to be agglomerated at one end of revolving retort, injecting on materials binding substances and molten materials in finely divided state and discharge agglomerated materials at other end cohering pieces thus formed.



## MINING SUMMARY.

Specially Compiled and Reported for the MINING AND SCIENTIFIC PRESS.

"Le Moniteur du Potrole Roumain," of Bucharest, publishes the following table of the output of petroleum by the different countries in the past three years (tons):

	1901.	1902.	1903.
America.....	15,000,000	12,557,000	10,980,000
Russia.....	10,600,000	10,320,000	10,950,000
Sumatra, Java, Borneo.....	1,600,000	830,000	732,000
Gulfia.....	827,100	713,800	576,000
Roumania.....	496,800	381,300	310,000
India and Burmah.....	404,100	325,400	209,000
Other countries.....	250,000	250,000	270,000
Totals.....	28,577,100	25,380,500	21,027,000

The oil production of the world has shown a steady increase during the last three years, except in the case of Russia, which has only half recovered from its bad year in 1903. America and Russia together produced about 25 out of the 28½ millions produced in 1904. British India and Burmah have made the most notable increase in the three years, having increased 24% in 1904, notwithstanding that 1903 was an increase of 55% over 1902.

### ARIZONA.

A reconnaissance economic study of the mining districts of Arizona will be made by F. L. Ransome, assisted by W. H. Emmons during 1905. They will also make a detailed survey of the Tombstone district, including a special investigation of the mining areas. Topographic parties have been at work near Florence under the direction of T. M. Bannon. R. T. Evans will have charge of a party in the Grand Canyon which will survey the Shinumo quadrangle.

#### Cochise County.

(Special Correspondence).—The Calumet & Arizona Co. at Bisbee produced for the month of May 1336 tons. This has been the average production for each month since January. Sixty days later ore will be treated from the Oliver shaft of this company, but the production from the Irish Mag shaft will be correspondingly lessened. Extra jackets are en route from the East for the furnaces at Douglas. The big stack and the dust chamber are completed and the construction force is hurrying the completion of the dust flue. At the smelters a reserve ore pile of 5000 or 6000 tons is kept on hand, which, in the event of a shut down at the mines or a blockade of the Crook tunnel, is sufficient to keep the smelters in operation for seven days.

Bisbee, June 19.

Larrieu Bros. & Chadwick are sinking a 100-foot shaft on their copper property in the Whetstones, north of Bisbee.

#### Gila County.

J. B. Benton is superintending work, near Paradise, developing a water supply for reduction works in the treatment of ore. The shaft through the ore body is down 200 feet, with but little water.

#### Pima County.

(Special Correspondence).—The Imperial Copper Co., operating in the Silver Bell district, is shipping copper ore to the smelter at Douglas. During the last fifteen months, 12,000 feet of underwork has been done. A large boiler is being put in at the old Union shaft preparatory to starting work through this opening. A 10-ton experimental concentrating plant will be built at once and the necessary machinery to permit of the using of crude oil fuel in place of coal will also be added. Silver Bell, June 19.

#### Pinal County.

(Special Correspondence).—A mine on the Arizona-Pacific property, 7 miles south of Kelvin, has been opened by a shaft 320 feet deep and a crosscut at the 300-foot level. The shaft will be sunk several hundred feet deeper. Two 60 H. P. boilers, a 35 H. P. steam hoist, a 50 H. P. compressor and an electric lighting plant capable of furnishing 200 lights have been put in at Woolly, the Arizona-Pacific camp.

Kelvin, June 19.

The 14-mile wagon road from the railroad at Winkelman to the Saddle Mountain C. & S. Co.'s properties has been completed. The company is building a 200-ton smelter and developing bodies of copper ore.—The Troy-Manhattan Co. at Troy expects to have its 100-ton smelter ready to receive ore by November 1. J. W. Sisson, president, and J. W. Cameron are placing orders for machinery and equipment for the new plant.

#### Yavapai County.

(Special Correspondence).—The White Gold Mining Co., east of Wickenburg, is building a 10-stamp mill with a power plant large enough to permit of the addition of twenty stamps more should it be found advisable. They are also putting in a cyanide plant.

Wickenburg, June 19.

T. W. Earnhart is running the Monica mill at Kirkland.—I. Anderson has charge of building the new plant of the Anderson Metals Extraction Co. at McCabe.—G. W. Middleton of Prescott intends to put in a 350-ton concentrator at Walker to handle the output of the Mudhole and Crook mines.—The tunnel of the Sonator mine, 12 miles south of Prescott, is in 2000 feet.—It is reported that the Copper Bottom mine at Quartzsite has closed down.—J. G. Dennis of San Francisco, Cal., is unwavering the News group, near Jerome, preliminary to examination.—Superintendent Beven is unwavering the Black Hills Copper Co.'s mines near Jerome, preparatory to starting development work.

The Rincon M. Co., near Martinez, have started their new 40 H. P. hoist and are sinking in the main shaft. The new mill is expected to be running by July 15.

### CALIFORNIA.

In response to the memorial presented to President Roosevelt by the California Miners' Association, the United States Geological Survey has begun an investigation into the conditions affecting the hydraulic mining industry of the State. The motive that inspired the memorial was hope that gold now buried in the ancient river channels of California may be rescued by the hydraulic mining process, it being held by the miners that such deposits cannot be profitably worked by any process except hydraulic mining, now restrained by anti-debris legislation.

#### Amador County.

It is reported that C. J. Newman, manager of the Volcano G. M. Co., has handed the Bolden and Tierakoff mines near Volcano, and will work both properties. He is putting a 10-stamp mill on the Volcano mine, near the West Point bridge, on the Amador side of the Mokelumne river, and has thirty men grading for the mill and in the mine. The tunnel is in 700 feet.—The South and Central Eureka companies have entered into a pumping contract, by which a pump with a capacity of 288,000 gallons per day is to be put in at the 2000-foot level in the South Eureka mine. A reservoir is to be made capable of holding 50,000 gallons. All the water of the two mines is to be diverted by means of iron pipes into this reservoir, and pumped from there with one lift to the surface. The pump is to be driven with a 150 H. P. motor put in at the pump. The electricity to drive the motor is to be transmitted down the shaft through armored cable. In the Central Eureka drifting is to be commenced at the 2400-foot level.

#### Del Norte County.

Considerable work is being done on copper claims in the Preston Peak district, 20 miles south of Takilma, Or. J. F. Sanger is working properties in the district. C. L. Mangum of Grants Pass, Or., and J. R. Reeves of Waldo are also working claims. This district gives promise of producing copper when transportation becomes cheaper.

#### Lassen County.

J. W. Sexton, manager of the Salt Lake M. Co., which has purchased claims on Metal Mountain, says that twenty men will be put to work. The mine is 40 miles from Reno, Nev., and 2 miles from the N. C. O. Railway.

#### Mariposa County.

(Special Correspondence).—The Ferguson mine, near Hite's Cove, has been leased to F. Mason and E. Mason, who have started work at this old-time producer, which has been idle for several years.

Hite's Cove, June 19.

#### Nevada County.

The South Lindsay mine, near Maybert, is owned by the Syracuse & California M. Co. C. Meyers has charge of running a tunnel. The ore body has widened.—Work is to be started at the Banner mine, near Nevada City, in which C. M. Belshaw is interested. The shaft is down 700 feet.—Work has been resumed at the Graham gravel mine on Shady Creek, near Nevada City.—The Taylor iron mine, near Indian Springs, 11 miles from Grass Valley, is to be tested by a drilling machine.—Work is to be started at the Ironclad mine, near Rough and Ready. A hoist, pump and a gallow's frame are to be put in. The plant will be run by electricity. The shaft is to be sunk deeper by Superintendent Skewes.

The discovery of gold south of Donner lake, along the banks of the Donner creek, in a valley 4 miles long and 1 mile wide, is attracting people there.

Grading out for a new 10-stamp mill at the Morning Star mine at Badger Hill, 6 miles from Nevada City, has been commenced. The shaft is down 85 feet.—Superintendent J. H. English of the Spanish Ridge mine, 2 miles from Washington, reports that twenty stamps are pounding on ore. The company is running a lower tunnel, from which it is taking out good ore. A hoist is also put in.

#### Placer County.

Buchanan & Lozano are putting in a plant at the Bellevue mine, near Ophir.—At the Lundquist mine, near Auburn, a tunnel is being driven from both sides of the hill.—M. Repose has a bond on the Dunlap, below Auburn, and will prospect the ground.—The Jupiter gravel mine, near Iowa Hill, has closed down, because of lack of water.—Roht. Jones has men at work at the Cash Rock, near Forest Hill. This is a river claim, and the work has to be rushed to get to bedrock and take out gravel before the rains come.

#### Plumas County.

The Empire mine, at Gold Valley, 12 miles northeast of Downville, is being worked under the direction of T. K. Code, who has started the mill and has almost reached the 500-foot level in the shaft. The shaft is to be sunk to the 1000-foot level.

#### San Diego County.

The Julian Con. M. Co., operating the High Peak, Helvetia and Warlock mines, near Julian, are arranging to place all their stamps in one mill, instead of maintaining a separate mill at the High Peak. The company also intends to do its own roasting and reduction.—The Owens mine, near Owens, under the management of S. N. Large, is being put in shape to sink the shaft from the 350-foot level to the 600-foot level.

There are three different minerals that are mined for their lithium contents—lepidolite and spodumene (both lithium silicates) and amblygonite (a lithium phosphate). Of these three the last contains the highest percentage of lithia, but thus far has not been found as abundantly as the other two. The only locality at which the amblygonite has been found in quantity is near Pala. This deposit of amblygonite was discovered in 1902, but there was no production of the mineral until 1904. All of the lepidolite that is produced in the United States for commercial purposes is obtained in San Diego county, principally from near Pala. There are two localities in the county at which lepidolite has been found in considerable quantity, one being near Banner and the other 7 miles east of Julian. No lepidolite was mined at either of these localities during 1904, and only the necessary assessment work was done. The greater part of the

lepidolite has been exported, while nearly all of the spodumene has been utilized by home chemical manufacturers. From information obtained from the various chemical companies in this country that manufacture lithium compounds it is learned that there is an overproduction of these minerals for domestic consumption, and that unless some new technical use can be found for the lithium salts—as, for instance, their use on a considerable scale for pyrotechnical purposes—there must be considerable decrease in both the demand and the price for them. The mistaken impression has been prevalent that there was a large demand for lithium minerals, but with their use restricted principally to the manufacture of lithium carbonate the demand is bound to be limited. The quantity of lithium minerals produced in the United States during 1904 amounted to 577 short tons, valued at \$5155. This is a decrease of 578 short tons in quantity and of \$13,270 in value, as compared with the production of 1155 short tons, valued at \$23,425, in 1903. Of this 1904 production the greater part was spodumene from South Dakota.

#### Shasta County.

D. J. Robinson, manager, and J. B. McAfoos, assistant manager of the Pittsburg & Mt. Shasta G. M. & M. Co., are operating the Bennington mines in the Iron Mountain district, 14 miles from Shasta. The tunnel is in 320 feet.

At the Great Western Gold Co.'s copper smelter at Ingot, Superintendent H. Haas says that in the first concentration, with 2% coke on the charge, a matte with 30% to 35% copper is produced. This matte is broken, and reconcentrated (with two-thirds of green ore on the charge, and the necessary quartz and limestone) to a 45% or 50% matte, using 3% or 4% coke on the charge. The temperature of the blast is from 460° to 700° F. In the matte concentration the blast temperature has to be lowered to increase the copper content of the matte. An inclined track runs along the front of the large settlers, from which the matte is tapped into molds resting on a truck. The slag is granulated and sluiced over the dump. The furnace gases are drawn through a downcomer into the brick flue-chamber. The flue-chamber walls have wire-screen panels, covered with concrete about 1½ inch thick, and painted with silicon graphite paint to counteract the action of sulphuric acid, anhydride and sulphur dioxide on the oxyhydrate of lime found in Portland cement. The dust drops into the steel hoppers and is not taken up again by the gas current. Underneath the hoppers an 18-inch track is placed to remove the dust by means of cars, and to take it to the briquetting machine. The brick flue-chamber is 61 feet long and 16 feet high and 9 feet wide, and has a cross-sectional area of 60 square feet. The lower portion has arched openings, to give the air access to the hoppers and to keep the entire structure cool. It is on the bin-floor level. This arrangement obviates the necessity of elevating any flue dust. The furnace stack had to be extended to give the dowlake a pitch of 45° to prevent dust collection. The extension of the flue-chamber is a steel pipe, 21 feet by 250 feet, running horizontally for 40 feet under the railroad trestle-bridges, and then following the slope of the hill on which is built the stack, which is of sheet-steel, 5 feet 3 inches in diameter by 125 feet high. Inside the uptake pipe is the dust conveyor, which drags on the reinforced bottom trough (of ¾ inch steel plate) and delivers the collected flue-dust into the last hopper of the brick flue chamber.

#### Sierra County.

Work has been commenced on the Mountain View gravel mine, 4 miles above Alleghany. The old tunnel will be extended ahead to tap the gravel channel. T. F. Edwards of Forest City is in charge.

#### Siskiyou County.

It is reported that the Advance mine will put in a 10-stamp mill on China gulch near Yreka.—The Red Hill placer mine on South Fork is putting in a large flume.—A large new concentrator is being put in at the Taylor Lake M. Co.'s mill.—The dredge at Callahan started again. Several buckets have been added to the bucketway, that will enable the machine to handle the gravel much deeper.—The Ball mine, near Yreka, is being prospected, and a sale of it and the Stephens mines is about to be closed with Eastern capital. W. H. Young is handling it.—The Carson & Kradle mine at Oro Fino, operated by the Medina M. Co., has been closed down temporarily while a cyanide plant is being put in at the Johnson mill to handle the ore.

#### Tuolumne County.

The mill at the Golden West, in the Phoenix lake district, 5 miles from Sonora, has been started up.—The mill at the Rawhide mine, at Jamestown, has been started.—Work has been commenced on the mine at Astraville bonded by T. Cook to Mr. Monroe.—Sinking is in progress at the New Calico mine, near Stent, the shaft having passed the 150-foot mark.—W. Lewis has bonded a quartz claim on the Teeter ranch, near Sugar Pine, to H. J. Dykes, who has started work.—J. E. Conde and W. V. Connally have bonded the Murphy ranch, near Big Oak Flat, and have commenced work.—The Blue Star, West Star and Tar Flat mining claims, south of Tuolumne, have been bonded to H. Pennington of Reno, Nev.

### COLORADO.

During 1905 W. Cross, of the United States Geological Survey, will complete the geologic survey of the Lake City and Engineer Mountain quadrangles and make a reconnaissance of the San Cristobal quadrangle and of adjoining parts of Colorado, Utah and New Mexico, assisted by E. Howe, W. A. Emmons, A. Johansen, L. H. Woolsey and G. F. Kay. With the assistance of J. D. Irving, S. F. Emmons will make a review of the economic geology of the Leadville district. A reconnaissance survey of the Yampa coal field in the northwestern part of the State will be made by N. N. Fenneman and H. S. Gale. W. S. Ward will have charge of the collection of statistics of minerals in Colorado, with special reference to gold and silver. The Fort Collins and Boulder quadrangles will be surveyed by topographic parties, under direction of F. Tweedy. A party in charge



of J. F. McBeth will be engaged in topographic work on the San Cristobal quadrangle.

#### Clear Creek County.

The Muscovite on Democrat mountain, near Georgetown, has been bonded and leased to S. H. Clift and R. D. Smith of Denver, and it is reported that they have completed arrangements for development.—A contract has been awarded for driving the Central tunnel, at Idaho Springs, an additional 5000 feet to R. McGillivray. The breast of the tunnel is now in 4000 feet.—The shaft on the East Griffith, near Georgetown, is being sunk 200 feet deeper.—Work has been resumed on the St. Paul property, after a temporary close down caused by a change of management. The upper tunnel, which is in 1500 feet, is expected to penetrate the St. Paul lode within the next 50 feet. The property is on Green Lake mountain, near Georgetown. Frank Leitchweiss of Denver is the new manager.

A good strike has been made in the Tropic mine, on Seaton mountain, near Idaho Springs, by E. D. Quigley.

#### Chaffee County.

(Special Correspondence).—Near Buena Vista mines are being worked by the Elkhorn M. & M. Co., the Lashaw Tunnel Co. and the Stratton G. M. Co. The Lashaw Co. intend building an aerial tramway to transport ore from the crosscut into Princeton mountain, which is said to have cut good leads. The Stratton G. M. Co. is building a stamp mill to treat their free milling ore, and are sinking on their property. The Elkhorn shaft is being sunk to the 500-foot level; it is down 375 feet. They are also driving a 1000-foot drift from the 300-foot level. The drift is now in 400 feet and has cut good ore, carrying 2½ ounces gold, associated with pyrite and marcasite. The company intends shipping crude ore and may put in a mill. F. J. Frost is superintendent.

Buena Vista, June 18.

A. Ackerson, manager of the property in Pomeroy gulch, in the Chalk Creek district, near Buena Vista, has been in Denver getting boilers and an air compressor, to be put in at the mine as soon as the snow is gone.—This company has kept two shifts working by hand all the winter, and have their tunnel in 200 feet. The tunnel will be driven 1000 feet.—It is stated by the various managers and superintendents that the Camilla G. M. Co., the St. Elmo Con. who owns the Pat Murphy, the Buena Vista G. M. Co., Lone Star, New York & Colorado M. Co. and various lesser companies will all resume work within two weeks, as the snow is going rapidly.

#### Dolores County.

Electric power is to be put in at the Group Tunnel mill of the United Rico Mines Co. at Rico.—The Rico-Creede Co. is running its mill in Rico, having started the tramway.—The Intrinsic Gold M. & M. Co.'s tunnel on Sambo hill, near Rico, is in 1200 feet.—Atlantic Cable shipments from Rico continue regularly at the rate of from 80 to 100 tons of zinc ore per week. The air compressing plant is in place and the air drills will be started soon.

#### Gilpin County.

Manager O. J. Duffield reports another strike from the Maury tunnel of the Colorado M. Co., in Campbell gulch, near Perigo. The company expects to have its mill in shape to handle the lower grade ores by July 1.—The Victoria-Phoenix G. M. Co., which recently purchased the Crown Point mine, on Mineral hill, near Boulder park, is preparing to put in machinery at the main shaft.—L. A. White intends to resume operations on the Gold Spring tunnel property, west of Tolland.—The Mountain Monarch M. Co. is working in Gambell gulch, in the Independent district, with J. C. Barrows of Rollinsville as manager. The main tunnel is being driven under contract to cut the Seth Thomas vein. The Lump gulch mill will be put up on the Mountain Monarch millsite in Gambell gulch.

Manager T. J. Stroud of the Snowdon, at the head of Silver creek, near Apex, has unwatered his shaft and is drifting at the 100-foot level.—The Annie H mine and mill in Elk Park, near Apex, will be put in operation soon. New machinery and pumps will be put in the shaft. C. A. McNell will be in charge. Stuart & Murray, attorneys in the Continental block, Denver, are interested in the property.—C. A. Noack of St. Louis and H. Baer of Apex have begun work in the Baer group, near Black canyon, 1½ mile from Apex.

#### Gunnison County.

M. Gossman and N. Christenson are working the Navaho property, in Box Canyon district, near Pitkin.—At the Little Sister group, near Ohio City, R. W. Spensley will sink a shaft to water level.

#### Hinsdale County.

F. D. Goody is superintending grading for the cyanide plant to be built at the Golden Fleece mill at Lake City.—D. E. Sowers will work the Golden Wonder mine, on Gold hill, near Lake City, during the summer.

#### Ouray County.

The Bankers' National plant near Imogen basin, which suffered from a snowslide April 2, is in active operation, with a full force.

J. Koebel and P. Ochs are preparing to resume operations on their properties at the head of Bear creek, above Ouray.

A. E. Lowe, representing the New York stockholders of the Adelia M. Co., near Mineral Point, says that as soon as road conditions permit supplies will be taken to the mine and a larger force put to work. The mine has been operated all winter with a small force engaged in developing and sinking the shaft, which is now down 300 feet.

Manager W. J. Hammond, Jr., of the Treasury Tunnel M. & R. Co., at Ouray, is excavating for an additional twenty stamps; ten stamps are now at work, and ten more are on the road, giving forty in all. The plant will be run by electricity. In the mine and mill there are fifty-five men at work, but this is to be increased to 100. Manager G. Crawford of the Red Mountain R. M. & S. Co. states that development is being pushed at all the workings. The Genesee tunnel is 2300 feet under Red

mountain, and it has cut several leads. The east drift from the Genesee tunnel is 1000 feet on the vein. The Joker tunnel, in which the air drills were first started December 11, is pointed toward the Guston 1600 feet under the hill, and has made a good record for speed. The company's railroad from Silverton to Red mountain is being put in order and is in operation to Chattanooga.—In the Bachelor district on the Denver & Rio Grande, the Exum, Newton & Hurlburt lease in the lower workings of the Bachelor continues to output high grade ore.

#### San Miguel County.

Leasers are working the Suffolk-Globe at Ophir.—E. E. Bassett, L. Nielsen and F. E. Trimble have taken a lease on the Morning Star mine on Bilk creek, near Ophir, and have started work.—Recently the Carribeau mine, near Ophir, has been worked with half shifts, on account of bad air. Every year since the mine has been worked this has happened twice a year—June and September.

#### Summit County.

Work has been started on the Southern Cross lode in McCullough gulch, near Breckenridge, under the direction of M. W. Mouat.—M. M. Howe is ground-sluicing on the Star placer in the upper Blue River district, near Breckenridge, and hopes to start hydraulic mining with giants.—About fifty men are employed at the Snowstorm placer, at Fair Play. Washing of gravel will commence in a month. The tunnel will be 400 feet in length and will furnish the outlet for the water and debris from the new workings.—J. H. Myers, Jr., has started work in the Mint tunnel at Frisco.—The development on the Laurium, near Breckenridge, by Walker & Niles, has opened up sufficient ore to warrant them in starting a mill for the treatment of fifteen tons a day.

#### Teller County.

Lessee Schoonover of the Schoonover Leasing Co. has struck good ore in the New Discovery, 1 mile from Cripple Creek, and will put in machinery and a gallows frame.—S. B. Innskeep, who recently secured a lease on the Agnes property on the slope of Beacon hill, Cripple Creek, has made preparations for sinking the shaft for at least another 100 feet, and perhaps 400, the shaft now being 100 feet deep.—Operations on the Lillie mine, Cripple Creek, owned by the Vindicator Co., are being pushed by Lessee J. E. Bergeron. The main shaft of this mine has been sunk 1500 feet.—Manager Little of the Dexter Co. is in the East making preparations for leasing this property. The shaft is 600 feet deep, and provided a lease is granted one of the provisions of the contract will be that the shaft must be sunk to the 1000-foot point.—Machine drills are to be put in the Sellers lease on the Gold Dollar at Cripple Creek. W. P. Sellers is superintendent.—The new mill of the Little Giant M. Co. in Pony gulch, near Cripple Creek, is nearly completed. Manager C. Burch has arranged with H. R. Weber of the La Bella Power Co. for electric power.—The main winze of the Anaconda Co. at Cripple Creek is to be sunk another 200 feet, giving a depth of 580 feet below the main tunnel level.—E. A. Colburn has taken a five-year lease on the Oak claim on Ironclad hill, Cripple Creek.—The Western Investment Co., operating on part of the Specimen claim belonging to the Stratton Cripple Creek M. & D. Co., on Bull hill, has completed putting in machinery and ore bins and expects to start mining operations.—The cyanide mill being constructed on the Los Angeles claim on Bull hill, Cripple Creek, is nearing completion and it is expected that active work will be started.—J. O. A. Carper, who is operating the War Eagle on Bull hill, Cripple Creek, under lease, is drifting at a depth of 70 feet.—The Gold Sovereign Co. at Cripple Creek has started sinking the shaft an additional 100 feet, which will make the main shaft 800 feet deep.

### IDAHO.

During 1905 a geologic reconnaissance and mining investigation of the region north and east of the Cœur d'Alene mining district, will be made by F. C. Calkins assisted by D. F. McDonald, of the United States Geological Survey. A reconnaissance study of the economic geology of the Pearl, Hailey, Mackay and Ketcham mining districts in southern Idaho will be made by J. W. Boutwell. The mineral statistics of the State will be made by V. C. Helkes.

#### Blaine County.

Since June 1 the Wood River Zinc Co. has been running its new concentrating plant on the War Dance property, near Hailey. Manager Williams states that since the concentrator began work the only effort has been to adjust the tables and crushers. There are two waste dumps at the War Dance which accumulated while the former owners mined for silver and lead. All the work was on the vein, so that the waste is zinciferous ores and lower grade lead and silver which, with the crude appliances and conditions prevailing several years ago, was not commercial. The first milling of Manager Williams will be these dumps.—At the Eureka mines at Bullion, 7 miles from Hailey, work is to be resumed by W. A. Wilson.

#### Boise County.

In the Pearl district J. C. Johnson, manager of the Little Gem M. Co., is putting in a hoist and work will be resumed on the shaft.—In the Osborne a 5-foot vein of ore has been opened in the shaft at a depth of 200 feet. Experiments are to be made on a shipment to Denver to determine the best method of treatment.

#### Custer County.

It is reported that the White Knob mine at Mackay has been ordered closed, and that the equipment is to be sold.

#### Idaho County.

The Rainbow G. M. Co. is working on Sable creek, 3 miles from Roosevelt. The company intends to put on a 50-ton reduction plant if the ore values continue.—The Dewey mill at Roosevelt has been temporarily closed down for repairs and supplies.—The new Sunnyside mill, near Roosevelt, was started June 5. The tramway is working well. J. Treweek of Salt Lake City is superintendent.—The mill for the Mysterious Slide Co.

has been shipped to Roosevelt.—Chas. Werdenboff and sixteen others are preparing to work placer mining ground in Yellow Pine Basin in Thunder Mountain district. It is the intention of the owners to take in a drill for boring on the tract to determine where the best channels are located. A large ditch, capable of carrying 500 inches of water, is being built for prospecting purposes.

The Adams M. Co. has the foundation of its mill complete, also a number of new buildings. This property lies on Divide creek and over the ridge from Roosevelt toward Cooney.—The Fairview will begin work soon.

The Adams M. Co. is putting a 50-ton mill on the property known as the Barnett group, on Divide creek, Thunder Mountain district, near Roosevelt. H. C. Willis is manager.

#### Shoshone County.

In the Pine Creek district, near Kingston, the management of the Bobby Anderson intends to put in a hoist and pumps at the old 180-foot shaft and to develop the property. T. Brown of Kingston and H. Harrington of Kellogg are interested.—The new 250-ton concentrator for the Hercules mine at Burke is expected to be ready by Aug. 1. In connection with the mill the company is building a tramway to haul the ore from the mine to the mill. The tramway will start from the mouth of No. 3 tunnel, whence it will be built around the hill to 1600 feet above the mill, whence the ore will be carried by a gravity tramway.—The German-American Co., working the Phoenix, 2 miles below Oshurn, will put in an air compressor. W. P. Beldine is in charge of the work.—The Silver Star tunnel, 2 miles east of Mullan, is to be extended 100 feet. W. H. Batting is president.—E. P. Spalding, manager of the Monarch mine at Murray, states that the Monarch mill will close down as soon as the ore in the bins and chutes is cleaned up. This action is taken simply because the margin of profit is too narrow after hauling the concentrates to the railroad. The first work will be to run a tunnel which will open the vein 600 feet below its apex. Work will be resumed in the long tunnel, which gives 1400 feet depth on the vein. This tunnel, after being driven 3000 feet, cut the vein in a barren spot.—The Wonderful mine, on Stevens peak, near Wallace, will resume work.—The Horst-Powell Co. is preparing to ship copper ore from its mine on the Little North Fork, near Kingston. They are figuring on putting in a concentrator this year.—W. D. Church of Walla Walla, Wash., will start work on the Colwyn, on Sunset peak, and the Mexican group, near Gem.

### MONTANA.

W. H. Weed will complete his report on the Butte mining district during 1905. A reconnaissance investigation of the lignites in eastern Montana will be made by M. R. Campbell, assisted by A. G. Leonard. The geology and underground water conditions of the Sun River area will be investigated by C. E. Siebenthal. A study of stratigraphy and paleontology in western Montana will be made by C. D. Walcott. A Hague will complete his monograph on the Yellowstone National Park.

#### Beaverhead County.

O. H. Howarth, of the Royal Geological Society of London, and B. E. Peto have been examining the graphite mines near Dillon.

#### Deer Lodge County.

Several suits for injunction have been brought by ranchers in the Deer Lodge valley against the Anaconda and Wasboe Cos. to stop the operations of the Wasboe smelter at Anaconda. It is claimed by the ranchers that the sulphur smoke and poisonous fumes from the smelter are ruining the land and killing the live stock. The company has settled with a number of ranchers and paid them satisfactory prices for their land. The remaining land owners affected by the smoke formed an association and pooled their claims and then appointed a committee to fix the sums that each should demand from the company. In that manner the price was fixed and presented to the company for payment. The company found on investigation that the property appraised for taxation was less than 5% of what the owners demanded and refused to settle on that basis. The association then brought injunction suits and named the amount of their damages, multiplying the original claims by about three, or about 98% higher than the assessed valuation of the property. The company claims it is a scheme to force the company to settle at the price demanded or have the smelter shut down.

H. C. Bacon says of the Cable mine at Cable that formerly only the upper levels were worked and the water was allowed to accumulate in the lower, but they are now being prospected with two diamond drills.

#### Silver Bow County.

A new three-compartment shaft is being cut on the Leonard property, near Butte, owned by the Boston & Montana Co. They have found it necessary to make this improvement because of the condition of the old shaft, which has become twisted. The new shaft is being made from various points below, and at the present rate of progress will be finished to the 800-foot mark in a short time.—The shaft on the Minnie Healey is in the same condition as that of the Leonard. It is 1170 feet deep, 70 feet having been sunk recently to make room for the skip chute.

In Silver Bow county there are 1400 patented claims; 1257 are lode claims; 465 are owned by the companies and 944 by individuals; 127 mines are being worked, and of these 80 are owned by companies and 47 by individuals. The average production is 14,000 tons per day and 11,500 men are employed by the mines and smelters of Butte.

### NEVADA.

#### Lincoln County.

The Newport-Nevada M. Co. has found good ore at a depth of 175 feet on the Homestake mine at Fay. Superintendent E. H. Hackett will start the 25-ton mill and will raise to the surface from the tunnel.

In the Golden Treasure mine, at Searchlight, the



Quartette Co. has temporarily stopped sinking at a depth of 870 feet, while a chute is being cut from the 800 to the 850-foot point. The east drift on the 800-foot level is in 50 feet. All shipping ore is being taken from the 700-foot level.

The Keystone and Barefoot mines at Goodsprings have been consolidated. C. F. Schrader of Los Angeles, Cal., T. G. Wimmer and H. H. King of Salt Lake City, Utah, are interested.

#### Nye County.

J. McKane and C. M. Schwab have purchased the Great Eastern property at Bullfrog from J. Sellers for \$80,000. Work has been resumed on the North Star mine, at Tonopah, under the direction of D. B. Gillies.

The mill of the Tonopah M., M. & D. Co. has been temporarily closed down. The following mines have machinery at Bullfrog: Montgomery-Shoshone, cars, track and whim; National Bank, power gasoline hoist; Gold Bar, whim; Shoshone-Polaris, cars and track; Yankee Girl, gasoline hoist; Amethyst, hoist ordered; Original Bullfrog, cars and track; Ladd-Benson, cars and track; Peary-Montgomery, cars and track; Amargosa G. M. Co., whim; Rhyolite Townsite mine, whim.

J. P. Branioy, manager of the Primrose claims, 5 miles northeast of Beatty, has commenced work. The Hicks & Leavitt mines, 35 miles south of Beatty, have been bonded to T. L. Oddie for \$150,000. Supplies and men have been sent to the mines.

The Beatty mining district, which includes a large part of what is called Bullfrog, has been dissolved, the claim owners unanimously agreeing to merge the Beatty district with the Bullfrog district in order to prevent confusion in the minds of the public.

#### OREGON.

##### Baker County.

A 10-stamp mill is to be built at the Connor Creek mine, 20 miles down Snake river from Huntington. The old mine was one of the first quartz mines discovered and opened in eastern Oregon. P. Basche of Baker City is interested. The old tunnel has been retimbered and pushed forward until there is 4200 feet of tunnel work.

At the Bonanza mine, near Sumpter, twenty stamps at the mill are dropping and five machine drills are busy on the 200 level. A. Caso has been retained by the Geiser-Hendricks Co. as consulting engineer, and will have control of its properties. L. V. Swigget, manager of the Golden Chariot, near Sumpter, says that work will be resumed at the mine putting in the hoist and pumps, after which the crosscut at the foot of the shaft will be driven to connect with the ledge. The Oklahoma M. Co. has been organized to work property on Goose creek, near Sanger. The property was partly developed by C. C. Cox, who organized the company. F. D. Smith of Sumpter, manager of the Snow Creek mine, and operating the Psyche and the Diadem properties, near Greenhorn, says that both the Snow Creek and Psyche mills are running, the California gulch placer, belonging to the Snow Creek Co., is operating and development is being pushed.

The suit between the Turnagain Arm Co. and the California Mountain Con. M. Co. regarding the California mine at Cableville has been settled by a cash payment and turning over of stock. The California Mountain Con. M. Co. goes out of existence. D. L. Killen of Sumpter is treasurer.

The James B. Sipe M. Co. has been formed, with J. B. Sipe president and manager, T. Kennerly vice-president, W. C. Winterhalter secretary, C. L. Mobney treasurer and W. F. Kippen superintendent, to buy and work the Buckeye and the Great American Fraction groups, near Bourne. It is reported that Manager Stott will put in a reduction plant on the Lily mine, near Greenhorn.

##### Jackson County.

The Yellow Jacket mine, on Forest creek, near Jacksonville, is being worked by H. A. Mears and W. F. Shaffer, who have shipped a carload of ore to the Tacoma smelter.

##### Josephine County.

The American Gold Fields Co., W. J. Morphy president and manager, intends to add ten stamps to the mill at the Granite Hill mine, near Grants Pass, making twenty in all. L. Y. Wickersham is superintendent at the mine.

Deposits of variegated marble in the Cheney Creek district, 11 miles from Grant's Pass, have been sold by H. K. Hanna and Bull Bros. to J. E. Chappell, A. Baker and J. Atkinson, all of Goldendale, Wash., and J. E. Verdin and B. T. Bull of Grant's Pass.

#### SOUTH DAKOTA.

##### Custer County.

The Extreme Co., owner of the Minnie May property, 2 miles northwest of Custer, is unwatering the main shaft preparatory to making some tests on the ore and performing further development.

##### Lawrence County.

W. Santry of Stillwater, Minn., president of the Columbus Con. near Lead, states he is preparing to build a big mill on the Columbus, and would also put in mine hoists, compressors and pumps. The mine adjoins the Homestake on the northwest. Operations are going forward steadily at the Clover Leaf at Rouhaix. The water is held below the 500, so that ore is being stoped on and above that level. Forty stamps are dropping. P. Wihaux, president of the company, is at the mine, and expects to unwater the shaft to the bottom. Manager C. A. Allen has resumed work at the Lucky Strike shaft, southeast of Lead City. It is 200 feet deep, and is equipped with a steam hoist, air compressor and pumps. The first work that will be done will be to continue the east drift from the lower level 30 feet farther, where it is expected a vein will be cut. The Echo G. M. Co. intend to put in machinery at the Echo mine at Maitland.

The Goldstake M. Co. is developing a property in the Maitland district. An electric drill has been working on the crosscut tunnel, which is in 700 feet, and is to be continued to a depth of 1700 feet. O. U. Pryce of Deadwood is manager.

#### UTAH.

##### Beaver County.

(Special Correspondence).—Marshall Field & Co. of Chicago have a sixty-day option on seventeen claims belonging to W. L. Croff of Eureka, Utah. These claims are in the Lincoln mining district and are within 8 miles of the Majestic smelter at Milford. The option is for \$80,000. Lead is said to have been discovered in this district in 1858. Several thousand dollars has been spent in development work.

Milford, June 19.

##### Juab County.

(Special Correspondence).—The old Bullion-Beck and Champion property is being worked mostly by leasers, 100 men being employed on lease account, and \$10,000 per month being taken from the forty blocks of ground now under lease. The company under Superintendent L. C. Doty is operating four machine drills doing development and prospect work. J. P. Hannifin, superintendent of the Little Chief M. Co., is doing prospect and development work. He has some ore, but not making any effort to take it out. He is using machine drills. The Snow Flake, which has been idle for the past two years, is being put in shape to start operations. It is understood now boilers will be installed later on. J. B. Evans is superintendent and W. Hatfield of Salt Lake City is manager.

The Uncle Sam Con. M. Co. is a consolidation of the Humboldt, Richmond, Anaconda and Uncle Sam. The Richmond and Anaconda are being worked by leasers and the Uncle Sam by the company. The 100-ton concentrating mill which was built by the company some time ago as an experiment is proving to be a good investment. The ore taken out with the shipping ore that is too low grade to ship is put through the mill. No attempt is being made at present to mine mill dirt except that which is taken out with the smelting ore. The ore is sorted in the mine. There are heavy streaks of mineral running through the mine which permits them to sort the first grade ore from the mill dirt without trouble. The expense of milling the first year was \$1.24 per ton, divided as follows: Labor, 53 cents; repairs, 27 cents; power and water, 34 cents; superintendent and assaying, 10 cents; total \$1.24. Twenty-one thousand tons of ore were put through the mill the past year, with an average assay value of 6.6% lead, 5.1 ounces silver and a trace of gold. From this amount of ore they produced 2944 tons of concentrates, with an average assay value of 38.3% lead, 20.8 ounces silver, \$2 gold, which shows an average saving in the mill of 83.8% lead, 58.2% silver. This saving is based on the selling of the concentrates as denoted in the smelter samples. The mill is operated eight hours daily. The hoisting plant, which was destroyed by fire last summer, has been replaced by a new plant. Eight thousand dollars has been spent the past year in development work in the mine. The production for the year shows 40% on the total production of the mine, according to General Superintendent C. C. Griggs. During the past year the company paid \$20,000 in dividends and another dividend ordered. Several more Callow tanks will be put in the mill. The officers of the company are: J. Dern, president and general manager, Salt Lake City; J. Chipman, treasurer and vice-president; W. Thompson, secretary; C. C. Griggs, general superintendent; W. M. Carter, mine superintendent; J. C. Jensen, mill superintendent.

H. M. Eakin, superintendent of the Mayday at Eureka, has been shipping twenty cars of ore per month until recently, as development work is being done instead. A 100 H. P. boiler has been put in, which will give power for operating the drills. The tunnel is 750 feet in length. The hoist, which is over a 300-foot shaft, is in the tunnel. Prospecting is being done on both the 200 and 300 levels. The ore occurs in pockets, and as soon as a pocket is worked out it becomes necessary to do prospect work for other bodies of ore. They are operating four machine drills. J. Roundy is superintendent of the La Reine M. Co., and has started drifting from the 300 shaft.

Eureka, June 19.

(Special Correspondence).—Near the head of Grand Central gulch, near Mammoth, the Grand Central mine, under the management of P. J. Donnelly of Eureka, is equipped with steel shaft buildings and steel head frames over a 1300-foot double-compartment shaft. They are taking out ore from the 1300 level. Ore being taken out at present averages \$20 in gold and 30 ounces silver. The mine is equipped with four 100 H. P. boilers, Ingersoll compressor and Cooper Corliss engine. They are operating ten drills and shipping twenty-five to thirty cars of ore per month. The 3-mile aerial tramway extends from the mine to the R. G. W. and S. P. L. S. & S. L. railroad tracks, and has a capacity of 150 tons per day, but at times they have carried over 200 tons in a day. They have recently finished sinking the shaft from the 1100 to the 1300-foot level. There are drifts from the second level down to the 1300 level. The output from the Carisa at Robinson is about 1000 tons per month. Most of the work is done by leasers. The company has a few men at work sinking a winze and doing other work. E. Hoffman is superintendent. J. Roundy of Eureka has charge of the work on the Black Jack, which joins the Lower Mammoth and Ajax. The shaft is down 1400 feet and work is being done on the 300, 1000 and 1300-foot levels.

S. McIntyre, superintendent of the Mammoth mine at Mammoth, is working 160 men. On account of a liberal contract with the United States S. Co. he is enabled to ship ore that heretofore was thrown over the dump. The company is the owner of a large mill on the railroad at Robinson, but on account of the nature of the ore they have never been able to treat it successfully through the mill. The shaft is down 2100 feet and levels each 100 feet. The tunnel is in 500 feet and connects with the shaft. The ore is brought to the tunnel level from the lower levels and brought out through the tunnel to the ore bins. The ore bins are on the tracks of the R. G. W. Ry. They are shipping 100 tons per day. Mammoth, June 20.

Work will be started on the West Mammoth and Golden Ray claims, owned by H. Deprezin of Eureka.

T. F. Singheiser of Salt Lake has a bond, the conditions of which are that work must be commenced before July 1. W. W. Matthews has charge of the work. The ore shipments from the Tintic district for the week ending June 17 were: Eagle & Blue Bell, 11 carloads; Yankee Con., 7; Ajax, 2; Carisa, 3; Grand Central, 7; Mammoth, 12; Victoria, 3; Centennial Eureka, 43; Gemini, 6; Bullion-Beck, 2; Monterey, 1; Swansea, 7; Uncle Sam, 1; South Swansea, 1—total, 106.—G. Paxman and D. Porter are operating a jigging plant at the South Swansea dump at Eureka. H. Waters and W. McDonald are shipping ore from their lease at the La Clode mine, near Silver City. It is reported that the company will resume work at the La Clode, with W. Frazer in charge. S. Waro is hoisting thirty tons of ore daily from the Swansea mine at Silver City. No work is being done below the 800 level. The Eureka Hill M. Co. will lease a portion of the old workings of the old Eureka Hill mine at Eureka. Superintendent Paul Troester says that the leasers will be allowed everything above the 100-foot level. The trouble over the consolidation of the Raymond and Illinois properties, north of Eureka, has been settled and work will be resumed. President J. C. Sullivan has called a meeting for June 26. It is thought that the development of the ground will be started July 1, to be carried on through the Raymond shaft, which is down 1500 feet. The tunnel at the McKinley M. Co.'s property at Eureka is in 645 feet.

##### Summit County.

It is reported that work is to be resumed at the Great Western and Mountain Lake mines, between Park City and Brighton, owned by D. Evans and J. Knight.

##### Tooele County.

(Special Correspondence).—The Consolidated Mercur mine at Mercur has three veins, one above the other. At times these veins lie flat and at other times dip. The veins vary in thickness from 8 to 10 feet, and at other places are 30 to 40 feet in thickness. The ore in the lower vein is oxidized and the middle and upper veins have both base and oxidized ore. The middle and upper veins have been worked since the mine was started and no attention was ever paid to the lower vein until the past year, since which time Manager G. H. Dern has done considerable work. Most of the ore is coming from the two upper veins and from places where the ore was believed to have been worked out. The "caving" system is used quite extensively in this property. A large amount of the work in the mine is driving drifts through old and caved workings. Wherever possible they are mining in open cuts by making chutes and allowing the ore and dirt to pass down to the lower or tunnel level, and from the chutes into cars. The cars underground are assembled by a horse from the different drifts to the electric tunnel or main entrance to the mine, and from there the electric motor takes them to the incline, which runs from the top of the mill to the tunnel level. The ore is hauled in skips from the ore bins below to the top of the mill. These skips hold about three tons and are hauled by means of a double drum hoisting engine. Five hundred feet of this track is on an incline of 45°, while the remaining 200 feet is perpendicular. About 800 tons are being treated in the mill at present. At the mouth of the electric tunnel is a sampling mill, where the ore is sampled from all parts of the mine.

One of the main industries of the Sacramento G. M. Co. at Mercur is the production of quicksilver. Within the past two years this company has shipped four carloads of quicksilver to different sections of the country, as well as filling local orders. They can handle 2500 pounds of ore, less the moisture, in their three retorts, but are putting in three more retorts, which will enable them to double their capacity. They are handling 140 tons of ore through their cyanide mill. The ore from which they extract the quicksilver also contains gold, but they cannot extract the gold values without roasting before cyaniding. When the tailings dump from the quicksilver retorts becomes large enough they will probably put in a plant to handle the dump to extract the gold values. G. W. Coeber is mill superintendent and E. W. Jones mine superintendent.

On the line of the Salt Lake & Mercur Railroad, between Fairfield and Mercur, the old Mercur or Manning mill is being operated on the old tailings dumps. These dumps were formerly handled by this cyanide mill. The ore or tailings is hauled to the top of the mill and thrown into bins. It is then drawn off and distributed to the leaching tanks, where it is allowed to leach from twelve to eighteen hours before being treated in strong solution. It requires three days to finish leaching. C. P. Briscoe, superintendent of the plant, says the total cost to treat the ore is 42 cents per ton. The ore does not have to be recrusbed. G. W. Gillman is metallurgist. Mercur, June 20.

#### WASHINGTON.

##### Clallam County.

According to R. Arnold, Clallam county, on the Olympic peninsula, in the northwest corner of Washington, contains two fields where coal occurs in apparently workable quantities. A small quantity of coal was shipped from one of the fields a few years ago. However, not much development work has been done since, and it remains for future exploitation to determine whether or not the deposits are of economic importance. One field lies in a synclinal trough immediately south of Freshwater bay. Its detailed structure, however, is imperfectly known, owing to the glacial drift which covers most of the country rock of the region. The presence of coal in this field was disclosed by a drill hole, which cut through three seams, as follows: A 4-inch bed at 40 feet, a 26-inch bed at about 250 feet and a 56-inch bed at 525 feet. The quality of this coal is said to be similar to that found in the Clallam bay field. The second field lies between Pillar Point and Clallam bay, and it also occupies a syncline. The structure of the basin is more or less complicated by sharp local folds and faults which may interfere with the working of the deposits. Three seams have been found in this field, the main one being 36 inches thick, while above this is a 22-inch bed and below it a 12-inch one. The coal is a clean, hard, glossy, black lignite, which breaks with a conchoidal fracture and contains some pyrites. According to M. R. Camp-



bell, this lignite is particularly well adapted for use in gas producers. The local demand for coal in the county is small. It therefore will have to be shipped if mined in very large quantities. A factor in favor of both fields is their nearness to the navigable waters of the Strait of Juan de Fuca. The coal, after mining, can be loaded immediately on sea-going vessels, thus doing away with much of the expense of handling and bauling to tide water, which is added to the cost of mining in the case of the other Washington coals with which the product of the Clallam county fields will necessarily come into competition.

## FOREIGN.

### CANADA.

#### BRITISH COLUMBIA.

##### Boundary District.

For the week ending June 17th the tonnage from Boundary mines was: Granby mines to Granby smelter, 11,289 tons; Mother Lode to British Columbia Copper Co.'s smelter, 3712 tons; Mountain Rose to British Columbia Copper Co.'s smelter, 66 tons; Oro Denoro to Granby smelter, 66 tons; Providence to Trail smelter, 30 tons. Total for week, 15,663 tons; total for year, 425,955 tons. Boundary smelters for the last seven days treated as follows: Granby smelter, 12,808 tons; British Columbia Copper Co.'s smelter, 4286 tons. Total for week, 17,076 tons; total for year to date, 447,350 tons.

##### Kossland District.

The winze from the ninth level of the Centre Star is 150 feet below the ninth level, or about 1400 feet from the collar of the shaft.

The shipments for the week ending June 17th were: Le Roi, 2050 tons; Centre Star, 1860; War Eagle, 1290; Le Roi No. 2, 120; Jumbo, 100. Total for the week, 5420 tons, and for the year, 157,194 tons.

##### Vanconver Island.

(Special Correspondence).—The Tye Copper Co.'s smelter at Duncan's Station ran 8 days during May and smelted 1501 tons of Tye ore, giving a return, after deduction of freight and refining charges, of \$23,070. The short run was due to installation of new machinery. Duncan's Station, June 17.

##### West Kootenay District.

The compressor for the Silver Dollar mine, on Mohawk creek, near Beaton, is being put in place. Water power is to be used for driving the plant. The pipe, 18 inches in diameter, is of wooden staves wound with galvanized iron wire and is coated with pitch. Timber is being hauled to the Beatrice mine, on Mohawk creek, and as soon as some of the timbers in the mine have been replaced and new work timbered, mining operations will be resumed.—The plant of the Silver Cup, at Five Mile, has been started and an upraise is being driven on the Sunshine tunnel.—Work has been resumed at the Oyster-Criterion mine.

### MEXICO.

The following money is minted by the Mexican government: Gold, 10 and 5 pesos; silver, 1 peso, 50 cents, 20 cents and 10 cents; nickel, 5 cents; bronze, 1 cent. The minting of money for private parties has been suspended, except for exportation. Fractional currency is legal only to the amount of \$20 in each payment of \$1000. Obligations contracted to be paid in foreign currency are paid with their equivalent in Mexican money at the rate of exchange prevailing on the day of payment. There is a reserve fund constituted of \$10,000,000 to regulate the circulating currency. This law went into effect in May, 1905, but the free coinage of silver ceased on April 16, 1905.

##### Chihuahua.

The American S. & R. Co. have work started on the San Antonio mine at Eulalia. — J. C. Brooks of Chihuahua is operating the Socorro mine and mill for J. W. Pender, near Sahuayacan. — Garcia & Arellano of the Chihuahua Exchange Co. have bought the Beneficencia claim in Santa Eulalia. — Ryan & Wilson, who have the option on the American mine in Terrazas, have decided to put in a new and larger pump, as they are convinced that the water can be banded. — W. C. Greene has bought the Harlan mine at Cocheno. — It is reported that as depth is reached in the Cigarrero mine, in Cerro Almoleza district, copper is coming in. It is believed by some that with depth that camp will change from lead to copper. — The pumps have been started on the Prieto mine in Parral. This mine has been leased by B. Gilpin of Los Angeles, Cal. — The narrow gauge railroad from the Chihuahua & Pacific's Guerrero Valley Extension to the Calera zinc mine, near Minaca, has been put in operation, and ore is being banded down to the main line for shipment. — At Dolores the Dolores Mines Co. has five stamps of its fifteen in operation and the cyanide plant is not completed. — L. A. Dockery and J. McDonald are doing development work on their property near the Dolores.

##### Durango.

T. S. Austin, chief metallurgist of the American S. & R. Co., has begun work on the 2000-ton smelter to be built at Velardena.

##### Guadalajara.

High-grade ore has been struck in the Santo Domingo mine, near Etzatlan, the property of the Amparo M. Co. of Philadelphia, which has doubled its shipments to the smelters, now shipping two carloads per day.

##### Guanajuato.

The La Luz M. & T. Co. is said to be preparing to drive a tunnel 12,000 feet long at a depth of 1400 feet to reach and unwater the La Luz, Bolanitos and other groups in Guanajuato. The mouth of the tunnel will be within 12 miles of Silao, and it will be for transportation as well as drainage purposes. J. C. Stewart is president of the new company, and the chief engineer is G. B. Burbank, who had charge of the work of harnessing Niagara Falls.

##### Jalisco.

E. J. Callahan has bought the Barranca mine, 10 miles

from Ameca, Jalisco, and has organized the Bonanza M. Co. to exploit the mine. T. Savage of Sunbury, Pa., is president, C. Sidler of Sunbury, Pa., is secretary and treasurer, and E. J. Callahan is general manager.

The Cuale M. Syndicate, in which H. L. Choistry and L. K. Purdon of Guadalajara are interested, is pushing development work in the Las Bolas mine in the Cuale district. A tunnel started by a Mexican company ten years ago is being continued.—Hydraulic machinery is being put on the property of B. H. Hammatt, in the Pihuamo district. The water supply is to be secured by constructing a dam across the Belem river and piping the water 3 miles to the placer field.—The Trinidad M. Co. has put in an air compressor and drills on its property in the Parnaso district.—A cyanide plant is to be put up at the San Felipe mines in the Hostotipanguillo district. Two concentrators were recently installed, but it has been demonstrated that cyaniding is necessary to secure the full values from the ores.

N. W. Kinross, manager of the Chatterton M. Co., has bought a one-half interest in the San Antonio y Anexas mines at Talpala and has agreed to spend \$100,000 for machinery and a reduction plant for the mines.

##### Oaxaca.

The Teziutlan C. Co. has purchased the Ocotes mines near Ejutla.—The Penoles M. & Dev. Co. has taken over seven old mines in the Penoles. The principal values are in gold. The Pilot Point M. Co. has completed a 10-stamp mill on its property, near Chibique, and development work is in progress. J. F. O'Connor of Dallas, Texas, is president.—A 10-stamp mill is being operated by the Mexican-American G. M. & M. Co. in the Sierra Juarez district.—The Mexico G. & S. Co. will import mining and milling machinery for its mines at Santiago Minas.

##### Sonora.

The Sonora G. M. Co., D. B. Maxwell manager, has acquired the Germania mine at Minas Prietas and is sinking two shafts.—At Promontorio the Promontorio Con. M. Co. are sinking a double-compartment shaft, which is down 200 feet. — Near Moctezuma the York mines have been bonded to a syndicate represented by O. L. Meer, manager Transvaal Copper M. Co.

The Garretson Sabuaripa Co. expect to blow in a 60-ton copper smelter at La Calera, Sabuaripa district, on July 1. Charcoal will be the fuel used.

The Sonora M. & D. Co. is operating the Dewey graphite mine near Hermosillo. S. W. Forsman is manager. The graphite occurs as a blanket deposit and was first found in opening up the ground to determine its merit as a copper property. The graphite as mined is sorted and screened to 1/4-inch for shipment. The shipments last year amounted to 400 tons. A double-compartment shaft sunk 135 feet on a copper ledge is being continued.

### NEWFOUNDLAND.

The mineral production of Newfoundland is reported by the Geological Survey of the Island as follows, for the year 1904:

Product.	Quantity.	Value Exported.	Total Value.
Barite, tons.....	2,000	\$ 4,750	\$ 5,000
Brick, thousand.....	1,236,000	.....	11,432
Building stone, tons.....	3,100	.....	4,550
Cobble and spawls, tons.....	4,000	.....	2,000
Copper ore, tons.....	107,839	395,723	466,739
Gold, ounces.....	11	.....	269
Granite, tons.....	1,945	.....	11,550
Iron ore, tons.....	589,739	585,739	589,739
Petroleum, barrels.....	700	.....	1,134
Pyrite, tons.....	60,200	210,700	210,700
Sand and gravel, tons.....	3,320	.....	5,800
Slate, tons.....	2,700	37,500	37,500
Talc, tons.....	1,562	7,000	7,000
Not specified.....	.....	200	200
Totals.....	.....	\$1,241,912	\$1,353,953

The ton used is the long ton of 2240 pounds. The total value for the year shows an increase of \$84,148, or 6.6%, over 1903. The number of persons employed was 2375—of whom 1131 were engaged in iron mining, 569 in copper mining, 285 in pyrite mining and 273 in quarrying. There were 4 persons killed, an average of 1.7 per 1000 employees.

## Personal.

W. C. RUTTER of Seattle, Wash., has been at Granite, Or.

C. E. RUEGER of Butte, Mont., has been examining mines at Phoenix, B. C.

J. S. GROW is superintendent Blue Jay copper mine, 20 miles from Stateline, Nev.

A. M. CARPENTER of Denver, Colo., is superintendent Takilma smelter at Takilma, Or.

W. G. LEWIS of Golden, Colo., succeeds J. F. Vivian as Surveyor General of Colorado.

H. SCHIELER of Weiser, Idaho, is superintendent Thunder Mountain & Big Creek M. Co.

J. E. SATTERLEY has been appointed superintendent Mass Con. mill at Grosse Point, Mich.

P. ARGALL of Denver, Colo., has been examining tin deposits in western Lawrence Co., S. D.

T. W. MACK of San Francisco, Cal., has been examining mines near Parral, Chihuahua, Mex.

H. A. MCQUEEN has been appointed assistant superintendent Rawhide mine at Jamestown, Cal.

D. J. FREW, secretary Holderman Filter Tank Co., of Salt Lake City, Utah, is in San Francisco, Cal.

N. I. LEYDIG has taken J. W. Ingersoll's place as superintendent Dakota mill at Deadwood, S. D.

E. J. CALLAHAN is manager Bonanza M. Co., working the Barranca mine, near Ameca, Jalisco, Mex.

W. S. KELLEY has resigned as manager Tintic M. Co.

and Yampa Smelting Co. at Bingham, Utah, and will devote his time to private interests.

T. J. GRIER, general superintendent of the Homestake mine, at Lead, S. D., has been in Chicago, Ill.

E. A. HOBART has resigned as superintendent mines of Pittsburg & Montana Copper Co. at Butte, Mont.

JAS. W. NEILL, who recently returned to Salt Lake City, Utah, from Butte, Mont., is in San Francisco, Cal.

F. J. TOUSSAINT has returned to La Cbumata mine, Arizona, Sonora, Mex., from a month's visit in Milwaukee.

C. E. CLAPP has resigned as director and fourth vice-president of the Crucible Steel Co. of America at Pittsburg, Pa.

J. M. THOMAS, superintendent at El Tiro mines of the Reina de Oro M. Co., Sonora, Mex., is visiting at Painesdale, Mich.

WM. ARNOLD of Butte, Mont., has been appointed assistant superintendent United Verde copper mine at Jerome, Ariz.

J. W. INGERSOLL has been appointed superintendent Hidden Fortune mill, near Deadwood, S. D., vice F. Steele, resigned.

T. A. RICKARD has resigned as editor of the Engineering and Mining Journal, the resignation going into effect on June 30.

F. YOUNG has been appointed superintendent Gold Reef Co., near Gilt Edge, Mont., succeeding J. H. McCormick, resigned.

R. B. LAMB has returned from Leonora, Western Australia, to accept a position with the American C. Co. at Encampment, Wyo.

H. A. SHIPMAN, superintendent Lake View Consols, has been transferred to the Oroya-Brownhill, Kalgoorlie, Western Australia.

WM. MAGENAU has been examining mines in western New Mexico. He is now associated with the Luna Lead Co. of Deming, N. M.

P. GAUDIN of the San Francisco del Oro mine at Santa Barbara, Chihuahua, Mex., is in France reporting on the property and will return in three months.

F. E. STEELE of Deadwood, S. D., has resigned as superintendent Hidden Fortune mill at Lead, S. D., to become manager of the new plant of the Victoria G. M. & M. Co.

S. NEWHOUSE of Salt Lake City, Utah, has been appointed managing director Montreal & Boston M. & S. Co. at Greenwood, B. C. W. C. Thomas has been made superintendent of the smelter and T. R. Drummond resident manager.

## Obituary.

CLARENCE HYMER, superintendent of the Hymer mine at Red Lodge, Mont., was killed in the mine June 9 by a heavy wheel falling on the back of his head.

HENRY BEGLINGER, one of the pioneer miners of Nevada county, Cal., died at North San Juan, June 20, aged 83 years.

TELEGRAPHIC REPORT from Mentor, Ohio, tells of a dreadful railway disaster at Mentor on the 21st inst., the N. Y. Central limited train dashing into an open switch while going a mile a minute. On board the fated train were Thos. R. Morgan and Chas. H. Wellman of the Wellman-Seaver-Morgan Co. of Cleveland, Ohio. The dispatch of the 22nd inst. states that Mr. T. R. Morgan was burned to death and that Mr. C. H. Wellman was scalded and burned to such an extent that it is feared his injuries will prove fatal.

## Books Received.

"The Fluorspar Deposits of Southern Illinois," by H. F. Bain, Bulletin No. 255, of the United States Geological Survey.

The United States Geological Survey has issued as extracts from "Mineral Resources of the United States for 1904," "The Production of Lithium Minerals," "The Production of Barytes" and "The Production of Asbestos."

Text books and other books of reference which treat on practical subjects in a practical way are valued by working engineers more highly than theoretical treatises. "Haulage and Winding Appliances Used in Mines," by Carl Volk, is a book of this kind. It is translated from the original German by Charles Salter. This latest contribution on the subject of hoisting in mines deals with the subject in a thoroughly practical manner, the author having omitted much of the theoretical side of the proposition. Hoisting ropes of the various types used, and their manufacture, together with the various devices for securing ropes to skips, cages, etc., is treated in the opening chapter. Then follows a discussion on the methods of underground transportation to the shaft. This includes tracks, switches, turntables and plates; the cars, and other vehicles, used in handling ore from slope to shaft; dumping devices, and the various conveniences employed in ore and rock handling in the mine. The chapter on cages and their construction, with safety devices employed, is interesting, and contains numerous practical suggestions. Shaft equipment and chairs also find a place here. It is unfortunate that so little space is de-



voted to the description of automatic or self-dumping skips, as these in many mines are taking the place of cages, it being recognized that ore may in many cases be handled more economically by skips than on cages. Considerable space is given to winding engines, for both vertical and inclined shafts, and this portion of the book is one of its most interesting and valuable features. Traction in mine levels is included, and goes into considerable detail in describing the various methods of haulage on level tracks and on those of low inclination. A short chapter is given to pneumatic hoisting, a method not as yet introduced in America, and used to only a limited extent in Europe. The aerial tramway, as applied to underground transportation, is described, as also is the various kinds of power applied—steam, water, air and electricity. An interesting section of the book is that describing "downhill haulage," that is, where ore or rock is to be sent from a higher to a lower level, in which the force of gravity is often utilized as a means of power. On the whole, the work is one that will prove useful to the student and mine superintendent, who is not "up" in mechanical engineering. It is published by D. Van Nostrand Co., 23 Murray street, New York, and by Scott, Greenwood & Co., 19 Ludgate Hill, London E. C., Eng. It will be sent to any address by the MINING & SCIENTIFIC PRESS upon receipt of the price, \$4.00.

## Commercial Paragraphs.

THE Salt Lake Hardware Co., Salt Lake City, Utah, have recently shipped to the Canadian Government one of their Kellor assay balances for use in the Geological Department, and also one to the Bureau of Weights and Measures for the United States Government at Washington, D. C.

THE Calkins Co. of Los Angeles, Cal., have acquired the corner in the Baker Block, Ardenia and Main streets, for their general offices and salesrooms, retaining their zinc shavings factory and chemical warehouse at their present quarters, 608 N. Main street. They propose to carry a full line of mine and laboratory chemicals and supplies.

THE Compressed Air Machinery Co. have an additional order from the Oliver Iron Co. of Duluth, Minn., for three Word Bros.' drill making and sharpening machines, making seven so ordered. They also have a similar order for one Word Bros.' machine from the Colby Co., Bessemer, Mich. Those machines furnish satisfaction wherever used. The Compressed Air Machinery Co., 24-26 First street, San Francisco, Cal., are sole manufacturers of this drill sharpener.

THE Rix Compressed Air Co. of 396 Mission street, San Francisco, Cal., report the sale to the California Gas & Electric Corporation, for the Oakland Gas Light & Heat Co., of two Laidlaw-Dunn-Gordon Cincinnati gear, heavy duty duplex compressors, each with a capacity of 100,000 cubic feet per hour at 20 pounds pressure, and one 12x18 booster, of same make, to boost portion to pressure 80 pounds, all to be driven by electric power. These are to increase the gas pressure in the mains. A similar plant, but of half the capacity and driven by Otto gas engines, has been sold to the Sacramento Light & Power Co. C. D. Lane has bought a 12-drill Laidlaw-Dunn-Gordon Cincinnati compressor and new style Torpedo drills for mines at Solomon, Alaska.

THE Ingersoll-Sergeant Drill Co. and the Rand Drill Co. have been united into a new company called the Ingersoll-Rand Co. The new corporation was formed under the laws of New Jersey with a capital of \$10,000,000, of which \$5,000,000 is preferred stock and the balance common. The factories of the two companies are located at Phillipsburg, N. J., Easton, Pa., Tarrytown, N. Y., Ossining, N. Y., Painted Post, N. Y., 34th St., New York City, and Sherbrooke, Quebec. They will be operated. The officers of the Ingersoll-Rand Co. are: President, W. L. Saunders, formerly president of the Ingersoll-Sergeant Drill Co.; 1st vice-president, George Doubleday, formerly treasurer of the Ingersoll-Sergeant Drill Co.; vice-presidents, Jasper R. Rand, formerly president Rand Drill Co.; John A. McCall, president New York Life Insurance Co.; J. P. Grace, vice-president of W. R. Grace & Co.; Geo. R. Elder, general manager manufacturing department; treasurer, W. R. Grace, formerly secretary Ingersoll-Sergeant Drill Co.; secretary, F. A. Brainerd, formerly treasurer Rand Drill Co. For the present the main offices of the new company will be at 26 Cortlandt St., New York City.

## Trade Treatises.

The Holderman filter tank cyanide method is described in a trade treatise from the company, whose office is 16-23 Commercial Club annex, Salt Lake City, Utah.

Lighting generators, alternating and direct current, receive suitable attention in a literary gem from the Crocker-Wheeler Co., Ampere, N. J., whose Denver, Colo., office is at 525 Seventeenth street, and San Francisco, Cal., office is corner Fremont and Howard streets.

The standard size (9x12 inches) catalogue of the Wellman-Seaver-Morgan Co., Cleveland, Ohio, is devoted to ore and coal handling machinery. There is a series of full page engravings, showing the equipment of the company's manufacturing plant, similar fine portraits of labor-saving ore unloaders in use at various places, and technical explanation of the efficiency and practical working of those machines. The economy and general advantages of the machines shown are graphically portrayed. The book is finely produced and is worthy of a place in any mining engineer's office.

## Latest Market Reports.

SAN FRANCISCO, June 23, 1905.

### METALS

SILVER.—Per oz., Troy: London, 27½d (standard ounce, 925 fine); New York, bar silver, 58½c, refined (1000 fine); San Francisco, 58½c; Mexican dollars, 47c, San Francisco; 45½c, New York.

COPPER.—New York: Standard, \$15.00; Lake, 1 to 3 casks, \$15.00@15.25; Electrolytic, 1 to 3 casks, \$15.25; Casting, 1 to 3 casks, \$14.25@14.75. San Francisco: \$16.00. Mill copper plates, \$17.00; bars, 18@24c. London: £66 2s spot per ton.

Copper prices show a slight advance in New York and London. It is estimated the exports for June will reach 20,000 tons, of which 3000 tons go to China. The supply and demand are seemingly well balanced at present and no material change either way need be anticipated in the near future. The total visible supply June 1 was 17,227 tons.

LEAD.—New York, \$4.60; Salt Lake City, \$3.50; St. Louis, \$4.12½; San Francisco, \$3.70, carload lots; 4½c 1000 to 4000 lbs.; pipe 6½c, sheet 7, bar 5½c; pig, \$4.85. London: 413 ½ long ton.

SPELTER.—New York, \$5.35; St. Louis, \$5.70; London, £24 ½ ton; San Francisco, ton lots, 6½c; 100-lb lots, 7c.

TIN.—New York, pig, \$30.60; San Francisco, ton lots, 31½c; 500 lbs., 32c; 200 lbs., 32½c; less, 33½c; bar tin, 3½c, 35@37½c. London, £139 5s.

PLATINUM.—San Francisco, crude, \$18.50 ½ oz.; New York, ingot, \$19.50 ½ Troy oz. Platinum ware, 75@82c ½ gram.

QUICKSILVER.—New York, \$39.00@40.00, large lots; London, 47 7s 6d; San Francisco, local, \$38.00@38.00 ½ flask of 75 lbs.; Denver, \$45.00.

BABBITT METAL.—San Francisco, No. 1, 10c; No. 2, 7c; No. 3, 6½c; extra, 17½c; genuine, 32½c; Eclipse, 35c.

SOLDER.—Half-and-half, 100-lb. lots, 20.75c; San Francisco, Plumbers', 100-lb. lots, 17.50c.

ZINC.—Metallic, chemically pure, ½ lb., 50c; dust, ½ lb., 10c; sulphate, ½ lb., 40c.

NICKEL.—New York, 55@60c ½ lb.; ton lots, 40@47c.

ALUMINUM.—New York, No. 1, 99% pure ingots, 35c; No. 2, 90%, 31@34c.

ALUMINUM.—No. 1, 99%, small lots, 37c ½ lb.; 100 lbs., 35c; 1000 lbs., 34c; ton lots and over, 33c, Pittsburgh. No. 2, 90%, small lots, 34c; ton lots and over, 31c, Pittsburgh.

### STRUCTURAL MATERIALS.

IRON.—Pittsburg, Bessemer pig, \$15.60; gray forge, \$16.00; San Francisco, bar, 3c ½ lb., 3½c in small quantities.

STEEL.—Bessemer billets, Pittsburgh, \$23.00@23.00; open heart billets, \$23.00@23.00; San Francisco, bar, 7c to 12c ½ lb.

WHITE LEAD.—Per lb., in kegs: 500 lbs. and over at one purchase, per lb., 7½c; less than 500 lbs., per lb., 8c; in 25-lb. tin pails, 1c ½ lb. above keg price; in 1 and 5-lb. tin cans, 100 lbs. per case, 1c per lb. above keg price. Dry Lead.—In bbls., 1 ton and over, 6½c; do. in kegs, 7c.

LIME.—Santa Cruz, \$1.25 country, \$1.25 city ½ bbl.

CEMENT.—Imported, \$2.15@2.65 ½ bbl.; California, carload lots, \$1.90 f. o. b. at works; small lots, \$2.20 ½ bbl. in sacks, 4 sacks to bbl., 5c for each sack returned.

NAILS.—This week the basic prices are: Wire, \$2.77; Cut, \$3.25. Meanwhile the nominal quotations per keg (list prices) are: No. 20d to 60d, Wire, \$3.35; Cut, \$3.55; 10d to 16d, Wire, \$3.45; Cut, \$3.35; 8d, Wire, \$3.50; Cut, \$3.50; 6d and 7d, Wire, \$3.60; Cut, \$3.60; 4d and 5d, Wire, \$3.70; Cut, \$3.70; 3d, Wire, \$3.85; Cut, \$3.85; 2d, Wire, \$4.10; Cut, \$4.10. Special rates for carload lots.

LUMBER.—(Retail): Pine, ordinary sizes, \$24.00@5.00; extra sizes higher; redwood, \$28.00@30.00; latb, 4 feet, \$4.50@5.00; pickets, \$21.00@25.00; shingles, \$2.50 for No. 1, and \$2.25 for No. 2; shakes, \$13.50 for split and \$15.00 for sawed; rustic, \$28.00@35.00.

### GENERAL SUPPLIES.

ANTIMONY.—New York, Cookson's, 7½c; Hallett's, 7½c; San Francisco, 1000-lb. lots, 9c; 300@500-lb. 9½c; 100-lb. lots, 10½c.

COAL.—San Francisco, coast, yard prices: Wellington, \$8.00; Seattle, \$6.50; Coos Bay, \$5.50; Southfield, \$8.00. Cargo lot, Eastern and foreign: Walsend, \$7.50; Brymbo, \$7.50; Pennsylvania, bd., \$14.00; Scotch, \$8.00; Cumberland, \$13.00; Cannel, \$8.50; Welsh Anthracite, \$13.00; Rock Springs, \$8.50, long ton; Colorado Anthracite, \$14.00. Coke, \$10.50 per ton in bulk, \$13.00 in sacks; Sunnyside, \$8.50, long ton.

POWDER.—F. o. b. San Francisco: No. 1, 70% nitroglycerine, per lb., in carload lots, 15½c; less than one ton, 17½c. No. 1\*, 60%, carload lots, 13½c; less than one ton, 15½c. No. 1\*\*, 50%, carload lots, 11½c; less than one ton, 13½c. No. 2, 40%, carload lots, 10c; less than one ton, 12c. No. 2, 35%, carload lots, 9½c; less than one ton, 11½c. No. 2\*\*, 30%, carload lots, 9c; less than one ton, 11c. Black blasting powder in carload lots, minimum car 728 kegs, \$1.50 per keg; less car lots, \$2.00 per keg. CAPS.—3x, \$5.50@6 per 1000; 4x, \$6.50@7; 5x, \$8@8.50; Lion, \$9@9.50, in lots not less than 1000.

FUSE.—Triple tape, \$4.00 per 1000 feet; double tape, \$3.50; single tape, \$3.10; Hemp, \$2.75; Cement No. 2, \$3.00; Cement No. 1, \$2.65, in lots of 3000 and up.

CANDLES.—Granite 6s, 16 oz., 40s., 11c ½ set; 14 oz., 40s., 9½c.

CHEMICALS.—Cyanide of potassium, 98%-99%, jobbing, 23@24c ½ lb.; carloads, 23@23½c; in tins, 30c; soda ash, \$2.00 ½ 100 lbs.; byosulphate of soda, 3@3½c ½ lb.; caustic soda, in drums, 3@3½c ½ lb.; Cal. s. soda, bbls., \$1.10@1.20 ½ 100 lbs.; sks., 90c@1.00; chlorate of potash, 12@13c; nitrate of potash, 6½@7c; caustic potash, 10c in 40-lb. tins; roll sulphur, 2½@2¾c; powdered sulphur, 2½@2¾c; flour sulphur, French, 2½@—c; alum, \$2.00@2.25; California refined, 1½@2c; sulphide of iron, 8c ½ lb.; copper sulphate, 5½@5¾c; chloride of lime, spot, \$2.50@2.75; sulphuric acid, in carboys, 66% B, 1¼@2c ½ lb.; nitric acid, carboys, 8c ½ lb.

OILS.—Lined, hoiled, hbl., 62c; cs., 67c; raw, hbl., 60c; cs., 65c; Lucol oil, hoiled, hbl., 54c; cs., 59c; raw hbl., 52c; cs., 57c. Kerosene—Pearl, per gal., 17½c; Asral, 17½c; Star, 17½c; Extra Star, 20½c; Eocene, 19½c; Elaine, 26c; Water White, in bulk, 11c; Mineral Seal,

iron bbls., 18c; wooden bbls., 20½c; cs., 24c; Mineral Sperm, cs., 26½c; Deodorized Stove Gasoline, bulk, 14½c, do., cs., 21c; 36° Gasoline, bulk, 25c; do., cs., 31c; 83° Naphtha or Benzine, deodorized, in bulk, per gal., 12½c; do., in cs., 19c; Lard Oil, E. W. S., bbl., 75c; cs., 80c; Neats-foot Oil, pure, bbl., 63c; cs., 78c; Sperm, crude, 63@68c; Natural White, 68c; Blonched, do., 57c; Whale Oil, cs., 52@67c.

BORAX.—Concentrated, 6@7c ½ lb.; powdered, 8@10c; fused, 20@25c; crystal, 7c; calcined, 25c.

BONE ASH.—Extra No. 1, 5@6c ½ lb.; No. 1, 4@5c.

LITHARGE.—Pure, in 25-lb. bags, 8@9c ½ lb.

MOLYBDENUM.—Best, \$2.75 ½ lb.

CHROMIUM.—90% and over, ½ lb., 80c.

URANIUM.—Oxide, ½ lb., \$3.50.

MERCURY.—Bichloride, ½ lb., 77c.

TUNGSTEN.—Best, ½ lb., \$1.25.

PHOSPHORUS.—American, ½ lb., 70c.

SODIUM.—Metal, ½ lb., 50c.

BISMUTH.—Subnitrate, ½ lb., \$2.10.

SILVER.—Chloride, ½ oz., 90c@1.00; nitrate, 55c.

RED LEAD.—500 lbs. and over at one purchase, ½ lb. 7½c; less than 500 lbs., 8c.

MANGANESE.—Black oxide, ½ lb., 2½@4c.

MAGNESIUM.—Pure, N. Y., \$1.60.

FIRE BRICK.—Domestic, carloads 1000, f. o. h., factory square, \$25.00; soap and split, \$22.50; arch and wedge, \$27.50; skowback, \$30.00; circle, \$32.00.

FIRE CLAY.—Domestic, 1000 lbs. in 125-lb. bngs, double, and dry ground, f. o. h., factory, \$8.50.

## New Patents.

DEWEY, STRONG & CO.'S SCIENTIFIC PRESS PATENT AGENCY, 330 Market street, San Francisco, has official reports of the following United States patents issued to Pacific Coast inventors:

FOR THE WEEK ENDING JUNE 13, 1905.

792,245.—CAMERA—J. W. Anderson, Santa Cruz, Cal.  
792,394.—TUBE COATING MACHINE—A. W. Buchanan, Pasadena, Cal.  
792,250.—DREDGER—L. J. & W. F. Crawford, Hoquiam, Wash.  
792,505.—WATER ELEVATOR—Dolling & Wheeler, Richland, Or.  
792,122.—ELECTRIC SYSTEM—J. J. Pagan, San Francisco.  
792,153.—VIBRATOR MACHINE—P. B. House, Chatsworth, Cal.  
792,230.—EXPANSIBLE PULLEY—L. J. Johnson, Petaluma, Cal.  
792,331.—EXCAVATOR—C. & J. T. Kerr, Armada, Cal.  
792,423.—CAMERA—H. E. Kiessig, Sacramento, Cal.  
792,233.—FURNACE—J. W. Lansing, San Francisco.  
792,234.—WAVE MOTOR—G. M. Lynch, Los Angeles, Cal.  
792,541.—WEEDER—N. McEachern, Walla Walla, Wash.  
792,158.—DRILLING MACHINE—P. McKinnon, Berkeley, Cal.  
792,435.—LADDER—E. A. Meacham, Riverside, Cal.  
792,236.—SCISSORS—Melander & Jaquet, Tacoma, Wash.  
792,330.—BUTTER CUTTER—N. Menard, Los Angeles, Cal.  
792,061.—CRATE—Morley & Meate, Salem, Or.  
791,380.—DRILLING SYSTEM—A. Nelson, San Francisco.  
792,344.—CHECK—J. W. T. Olan, Seattle, Wash.  
792,458.—WOOD PRESERVATIVE—R. P. Reynolds, Walla Walla, Wash.  
792,242.—CAN—P. S. Teller, San Francisco.  
792,371.—HOLDBACK—A. P. Weeks, Santa Cruz, Cal.  
792,372.—ENGINE VALVE GEAR—J. L. Wheeler, San Francisco.

## Notices of Recent Patents.

Among the patents recently obtained through Dewey, Strong & Co.'s SCIENTIFIC PRESS United States and Foreign Patent Agency, the following are worthy of special mention:

CONCENTRATOR ATTACHMENT.—No. 791,711, June 6, 1905, Frank S. Morgan, Nevada City, Cal. This invention relates to a device which is especially designed for use in conjunction with concentrators for the purpose of saving gold and amalgam and separating these valuable substances from slimes and sulphurets with which they may be associated. It consists of the combination with an endless traveling concentrator belt and the oscillating frame thereof, of standards fixed to and rising above the frame, an amalgamated plate supported upon said standards and inclined downwardly toward the head end of the belt, distributing boxes at both ends of the plate, means adapted to deliver pulp directly from a battery or feeder into the distributing box at the higher end of the plate, means for imparting a transverse oscillation to the frame and plate, and means within the lower distributing box to separate the free gold and amalgam as they flow with the pulp from the feeder to the belt.

DECORATING MACHINE.—No. 791,681, June 6, 1905, Henry T. Epperson, San Francisco, Cal. This invention relates to a machine which is designed for decorating china, glass, and ceramics generally, both over and under glaze, but is particularly adapted for under-glaze work. Its object is to overcome the difficulties of previous methods and to provide a rapid and accurate decoration of such articles as the machine is applicable to and which can be operated by inexperienced operators. The device comprises means for decorating articles, said means including a revolvable pattern carrying disk, a color distributing roller, adapted to be rotated by contact with the disk, means whereby the roller is advanced continuously in one direction simultaneously with its rotation, and means whereby the roller at the completion of its advanced movement may be moved out of contact with the disk and returned to initial position without contacting with said disk.

EXPANSIBLE PULLEY.—No. 792,230, June 13, 1905, Leune J. Johnson, Petaluma, Cal. This invention relates to an improvement in power-transmission devices wherein the driving pulley may be expanded or contracted in diameter and the driven pulley actuated by a driving chain, belt, or rope may be correspondingly contracted or expanded, so as to change the rate of speed. The device consists of an improved expansible pulley having in combination radially-disposed arms, a hub, and a shaft to which the hub was fixed, rims at the outer ends of the arms and in the plane of the outer faces thereof whereby the arms extend up along the inner faces of the rims to the periphery thereof, sections slidably fitting the inner faces of the arms and removable through the space at the top between adjacent rims and members within the sections and having projecting points at each end, said members being pivoted and tiltable within the blocks to present either point to engage with the power-transmitting chain.

CONTAINING CAN.—No. 792,242, June 13, 1905, Philip S. Teller, Alameda, Cal. This invention relates to improvements in containing cans; and it is especially applicable to cans which are designed to contain butter and like substances and a saline or other solution in which the contained substances must be continually submerged. The device consists of a can having a sheet-metal body of substantially even diameter, and having the top formed with a divergent upwardly-extending flange, a top having a dome-shaped centrally-located chamber, a surrounding upwardly-divergent flange and an intermediate portion of the top adapted to form a shoulder or stop, said body containing a liquid preservative and a block of butter submerged therein, and said dome-shaped chamber adapted to retain a portion of the preservative above the butter, and said annular portion serving to prevent the butter rising into the chamber and to insure its being always submerged in the preservative.

METALLURGICAL FURNACE.—No. 792,233, June 13, 1905, Jacob W. Lansing, San Francisco, Cal. This invention relates to improvements in metallurgical furnaces, and particularly in furnaces employed for the treatment of telluride ores. In recent years many mines have been opened up and worked in which gold and other valuable exist in great quantities in combination with tellurium; but in order to extract these values it is necessary first to roast the ore. This roasting has generally been done in open furnaces, with the result that a considerable proportion of the values have passed off in the form of tellurium-fumes and have become entirely lost. The object of this invention is to employ a closed furnace and to provide means in conjunction therewith to collect and condense these otherwise lost tellurium-fumes and to save their values.



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OF THE

## Mining and Scientific Press

FROM JANUARY TO JULY, 1905

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